



@CREATE
Singapore

DesCartes

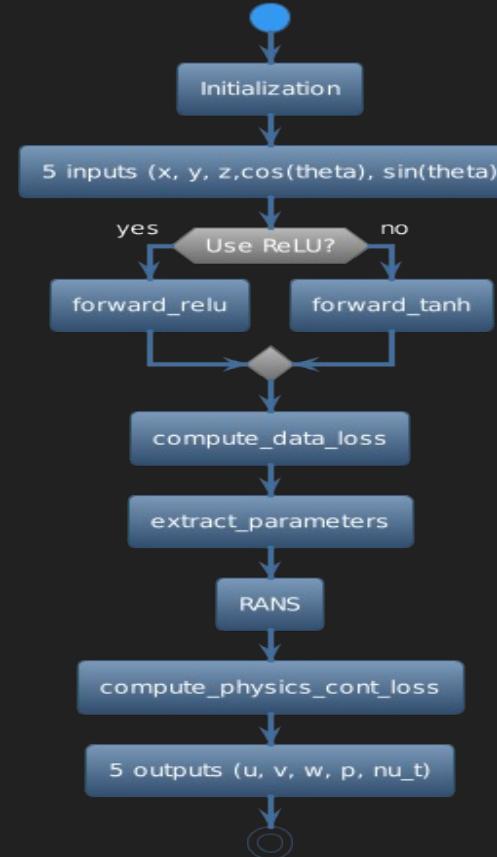
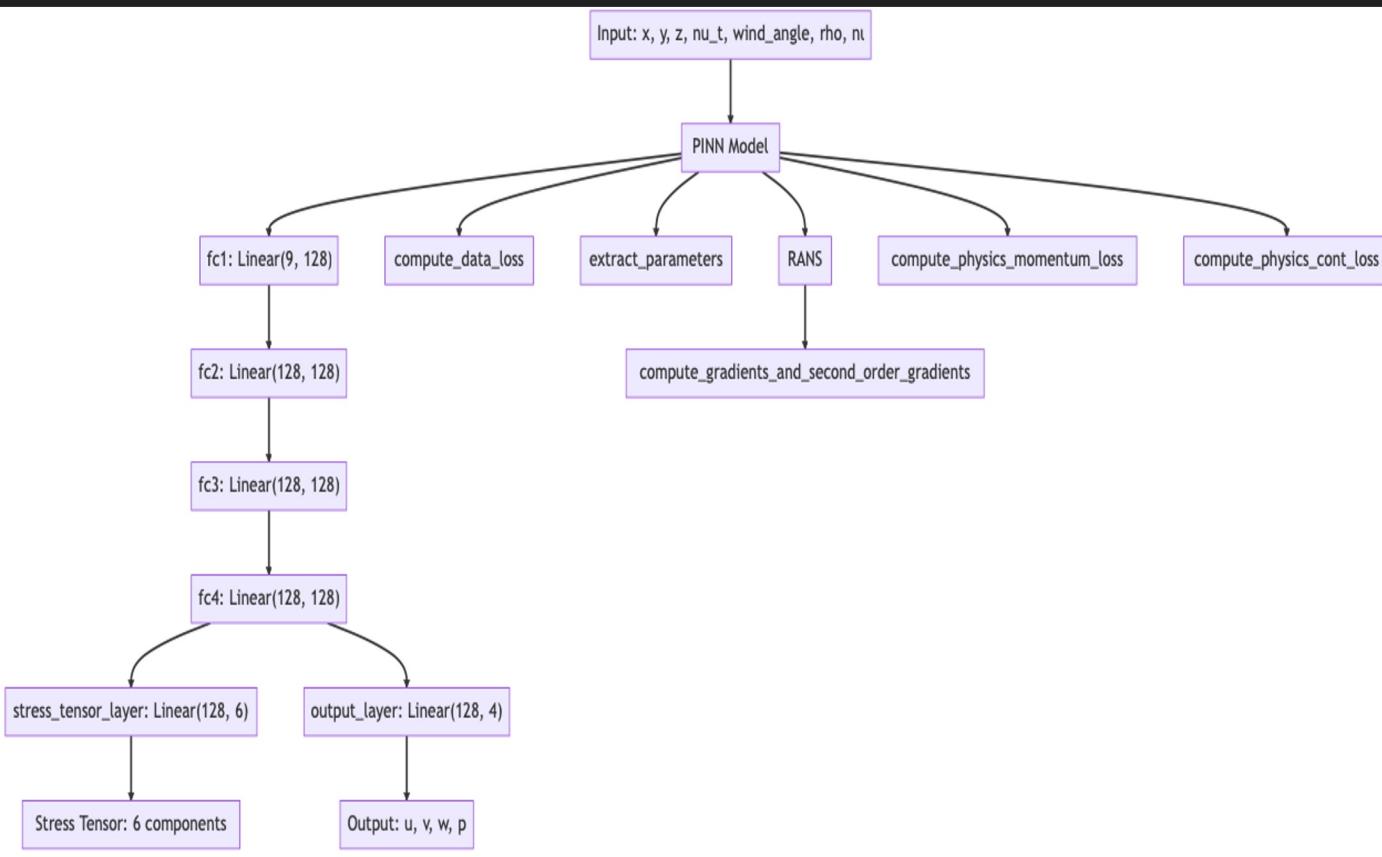


PM003 – 23* October 2022

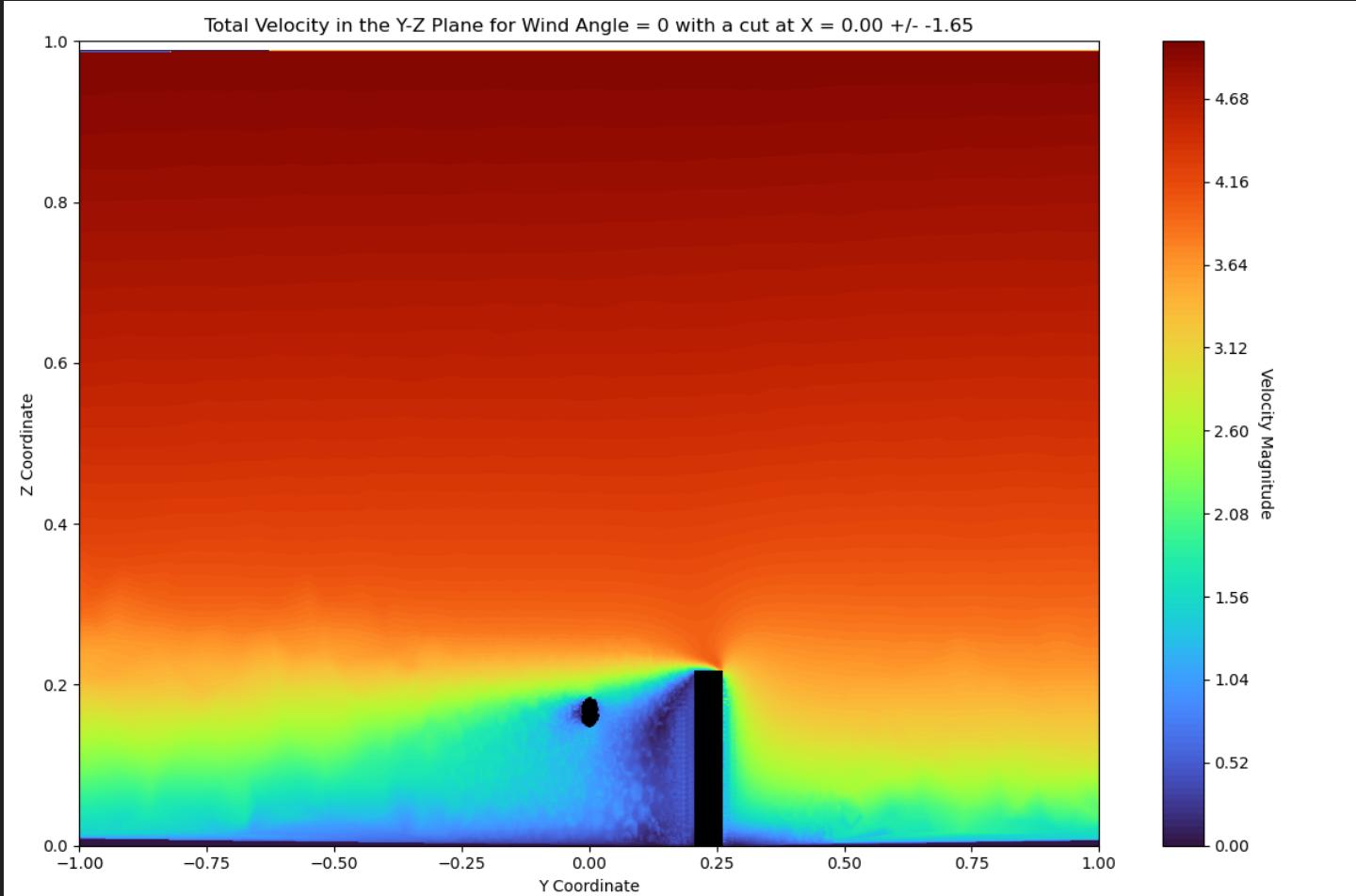
Update on PINNs

Application to Urban Wind Field Dispersion Studies

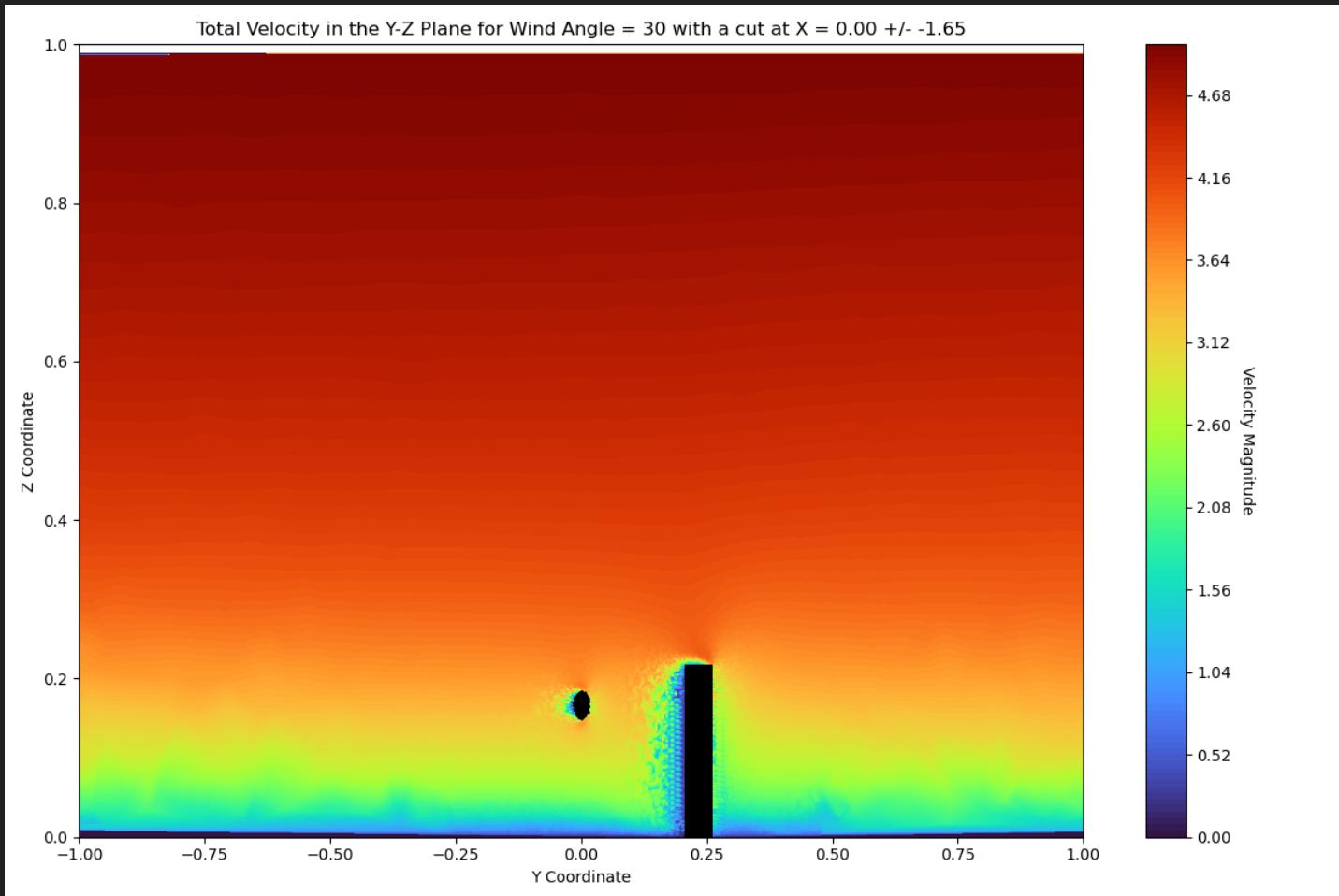
Neural Network Architecture – Previous vs Updated



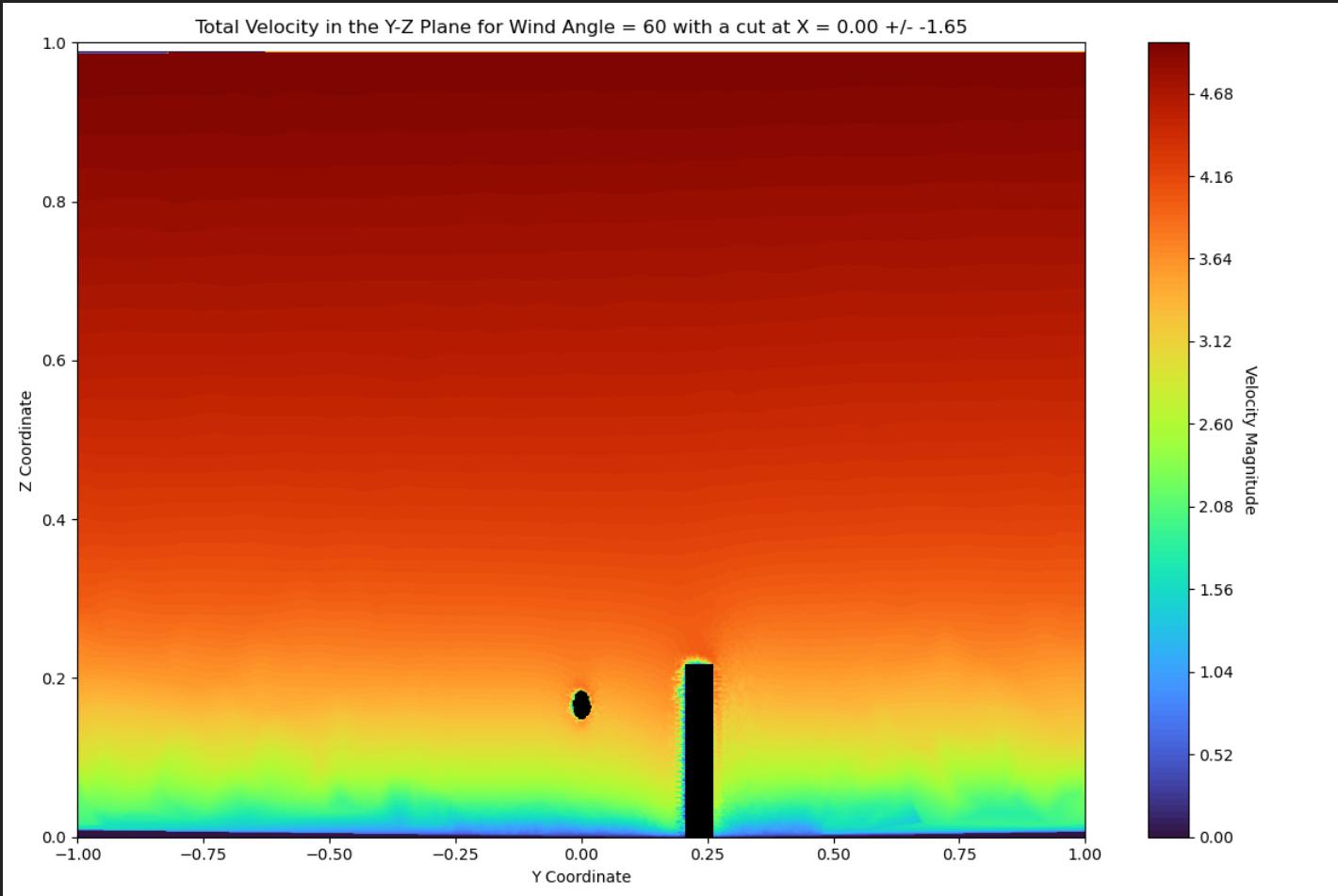
Data Plots – wind angle = 0



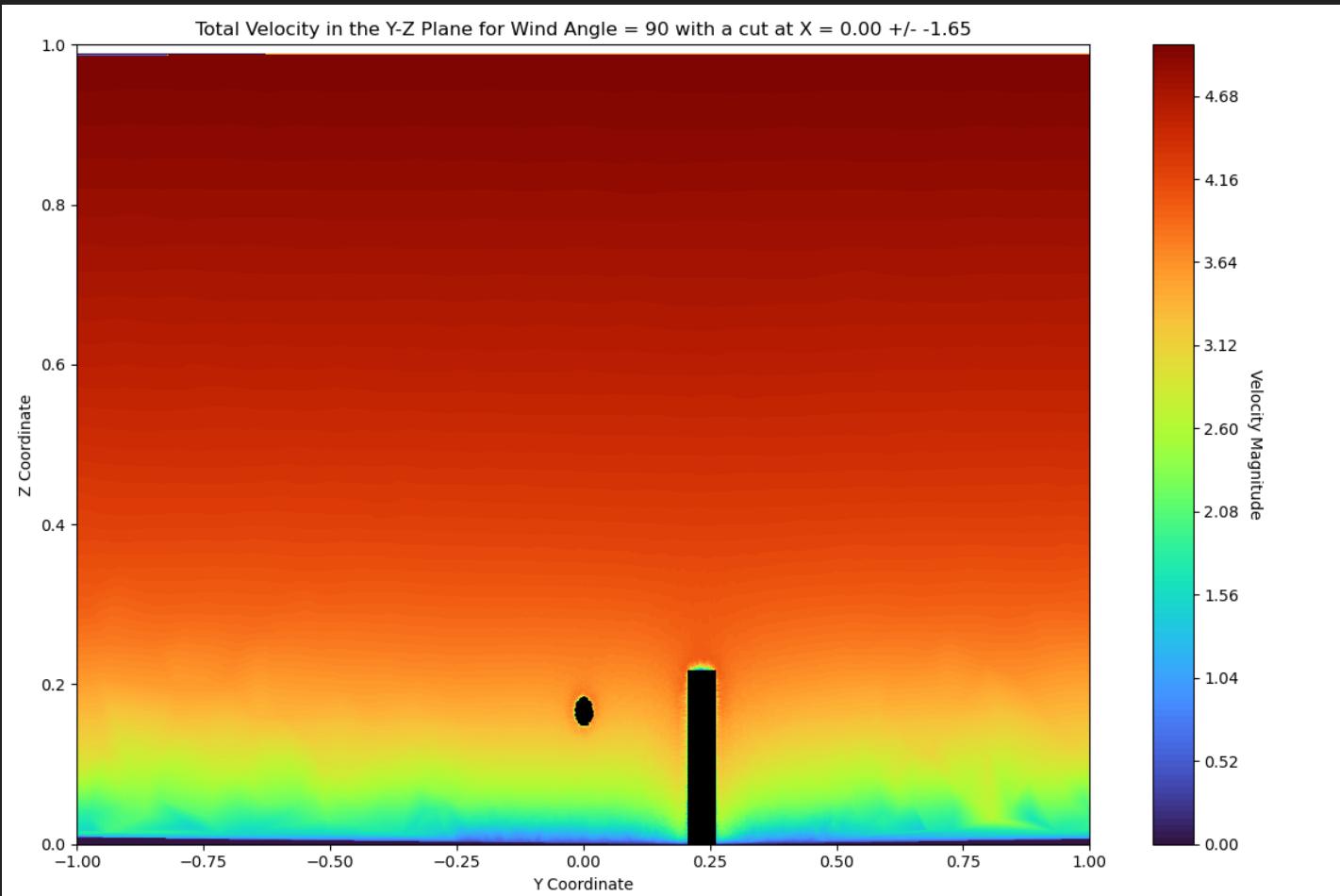
Data Plots – wind angle = 30



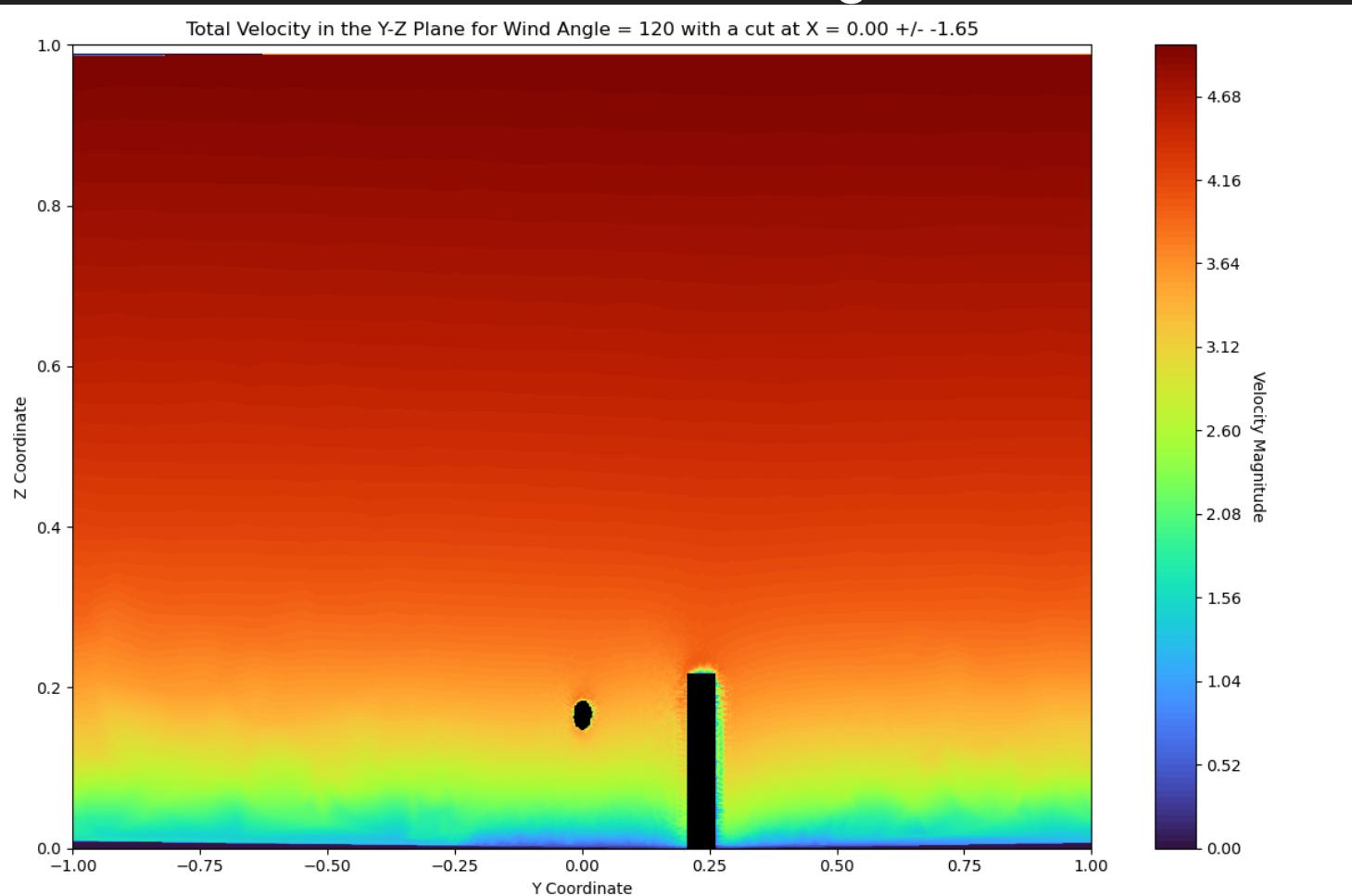
Data Plots – wind angle = 60



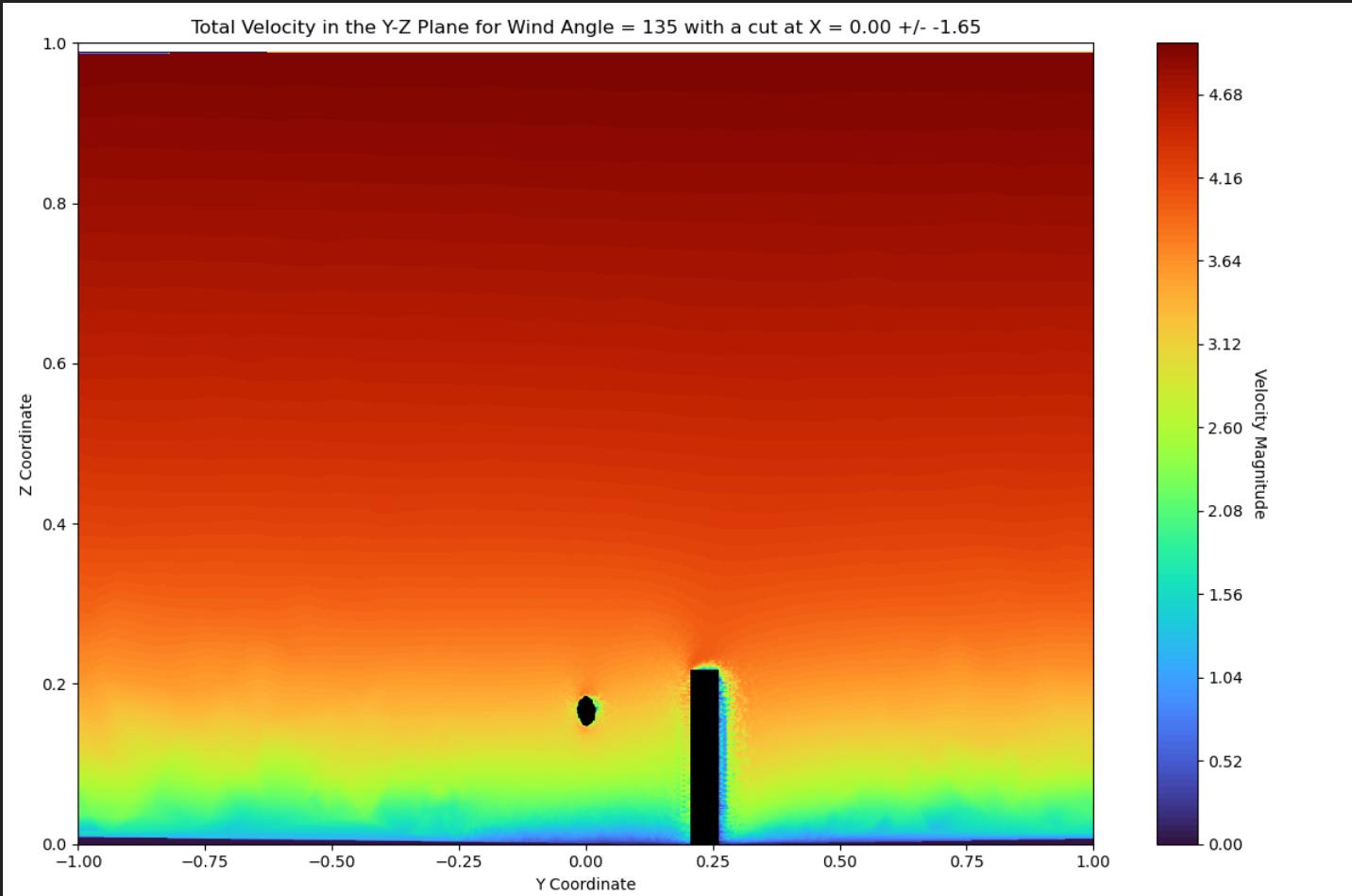
Data Plots – wind angle = 90



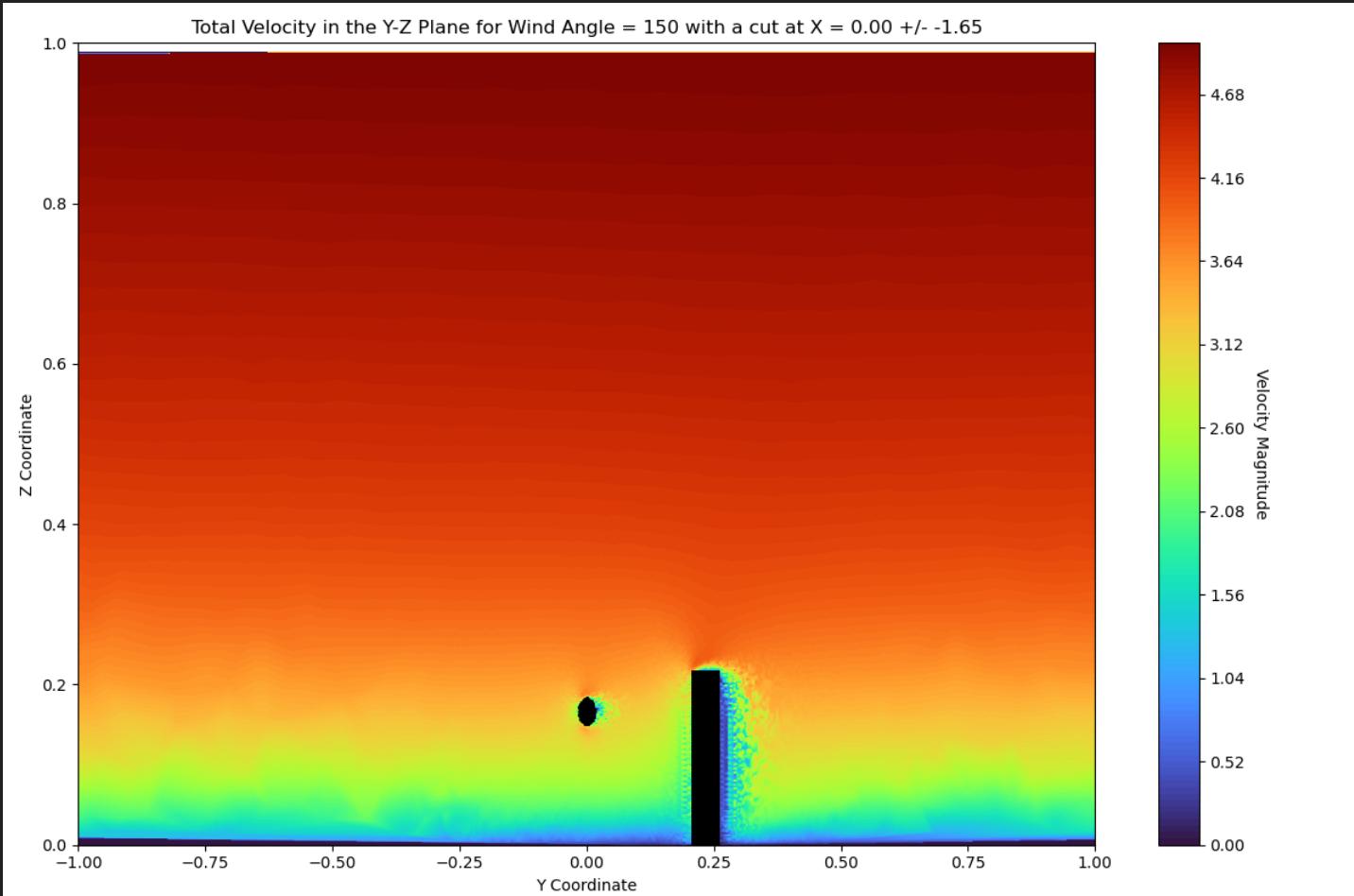
Data Plots – wind angle = 120



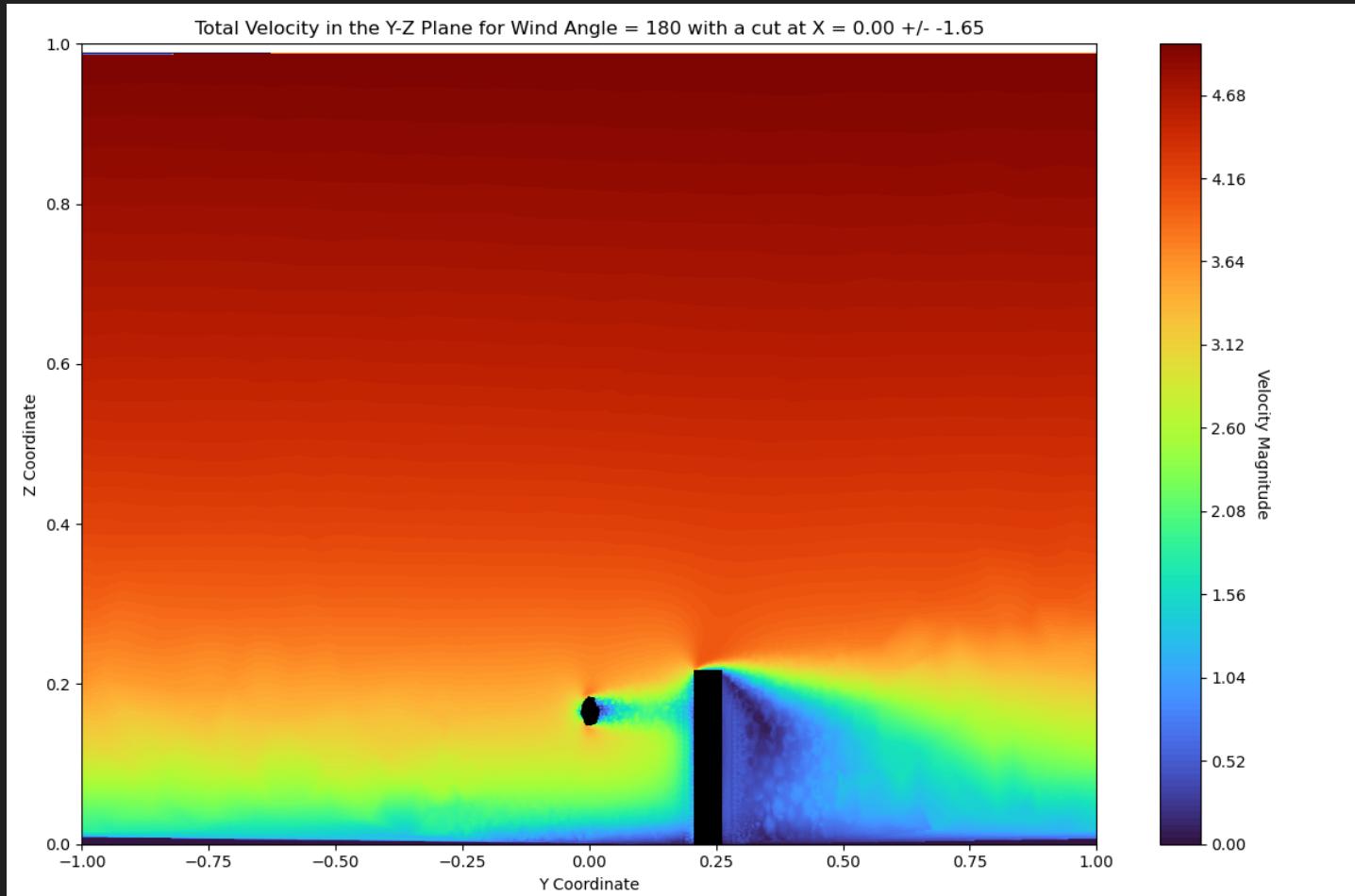
Data Plots – wind angle = 135



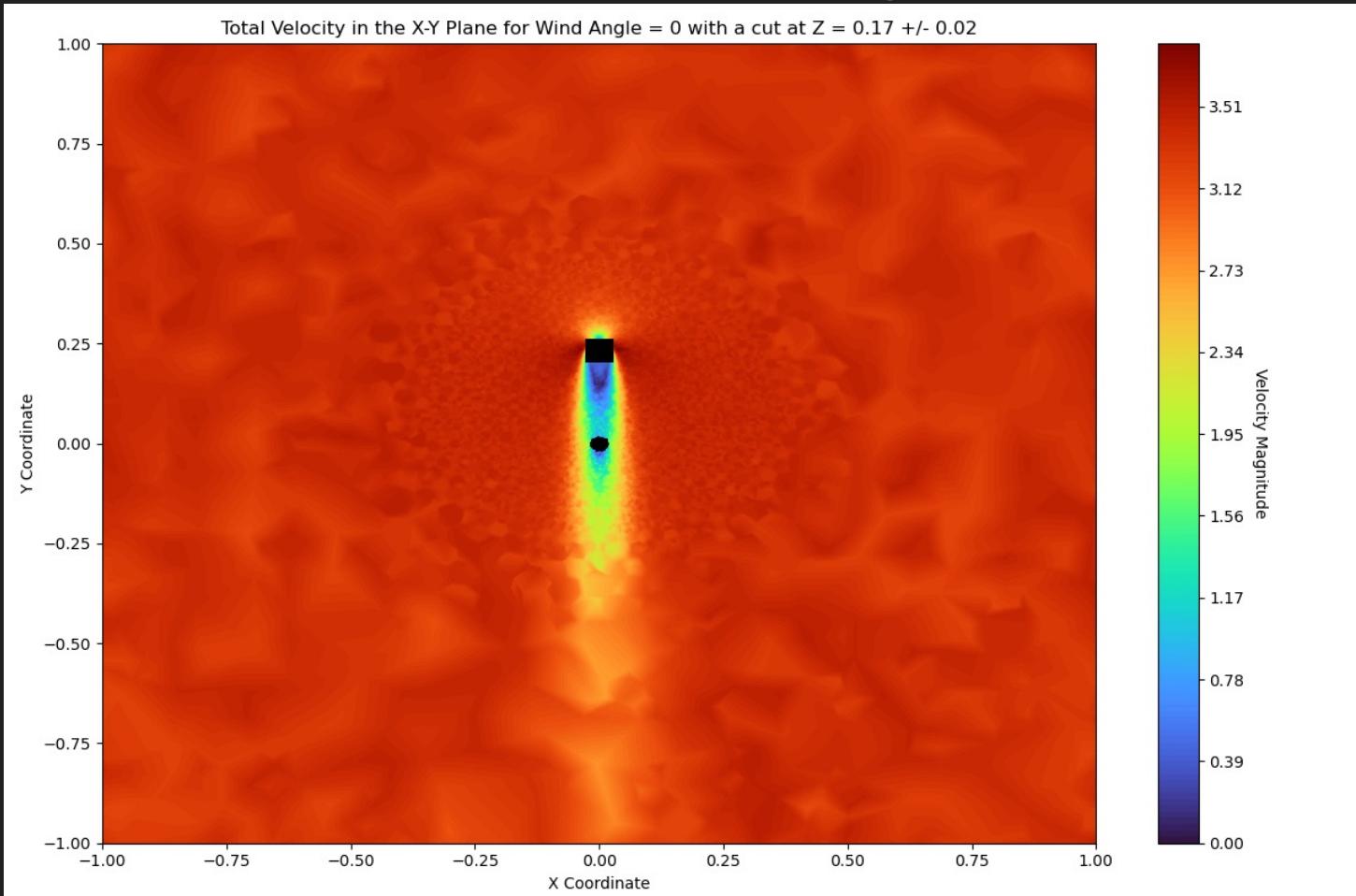
Data Plots – wind angle = 150



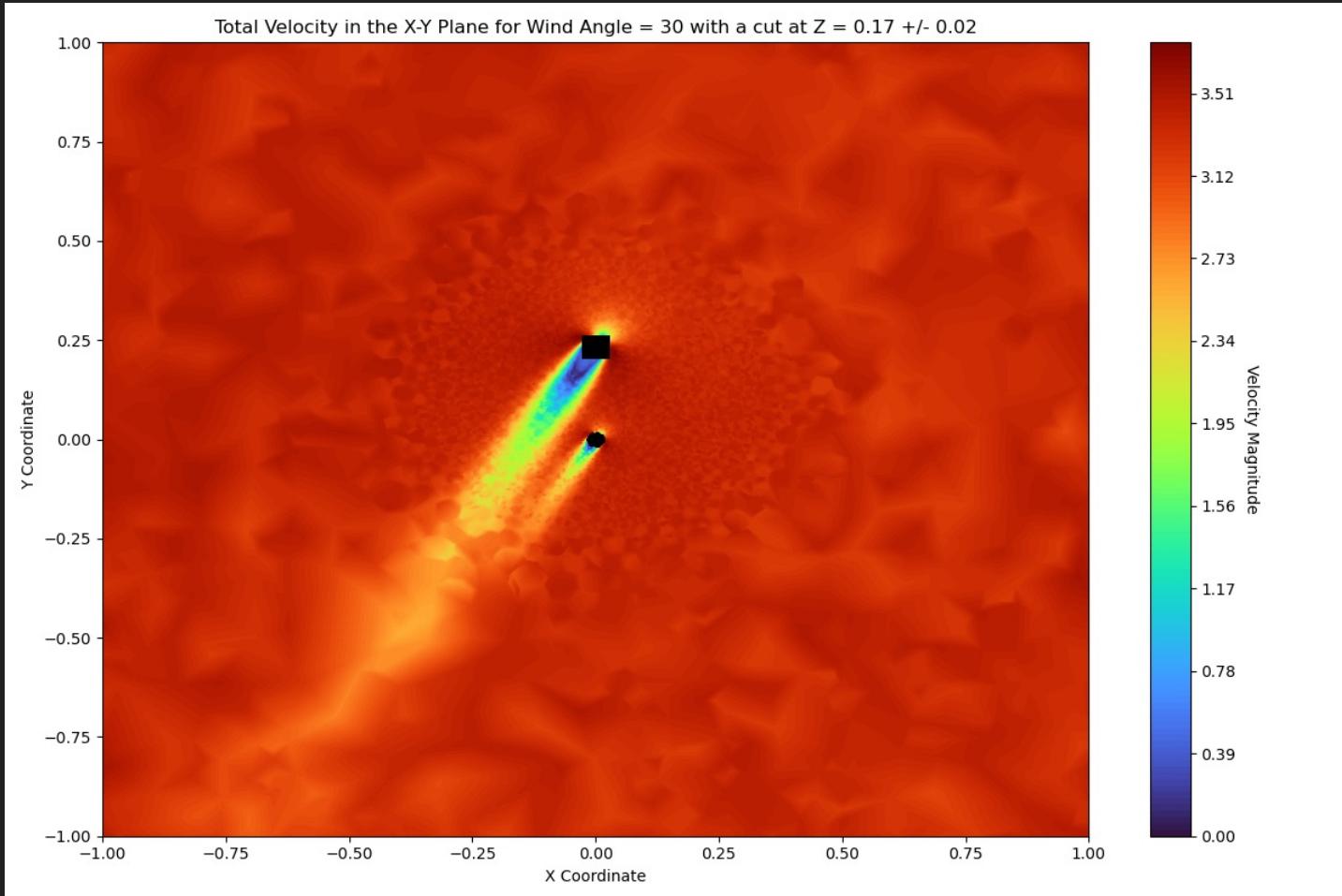
Data Plots – wind angle = 180



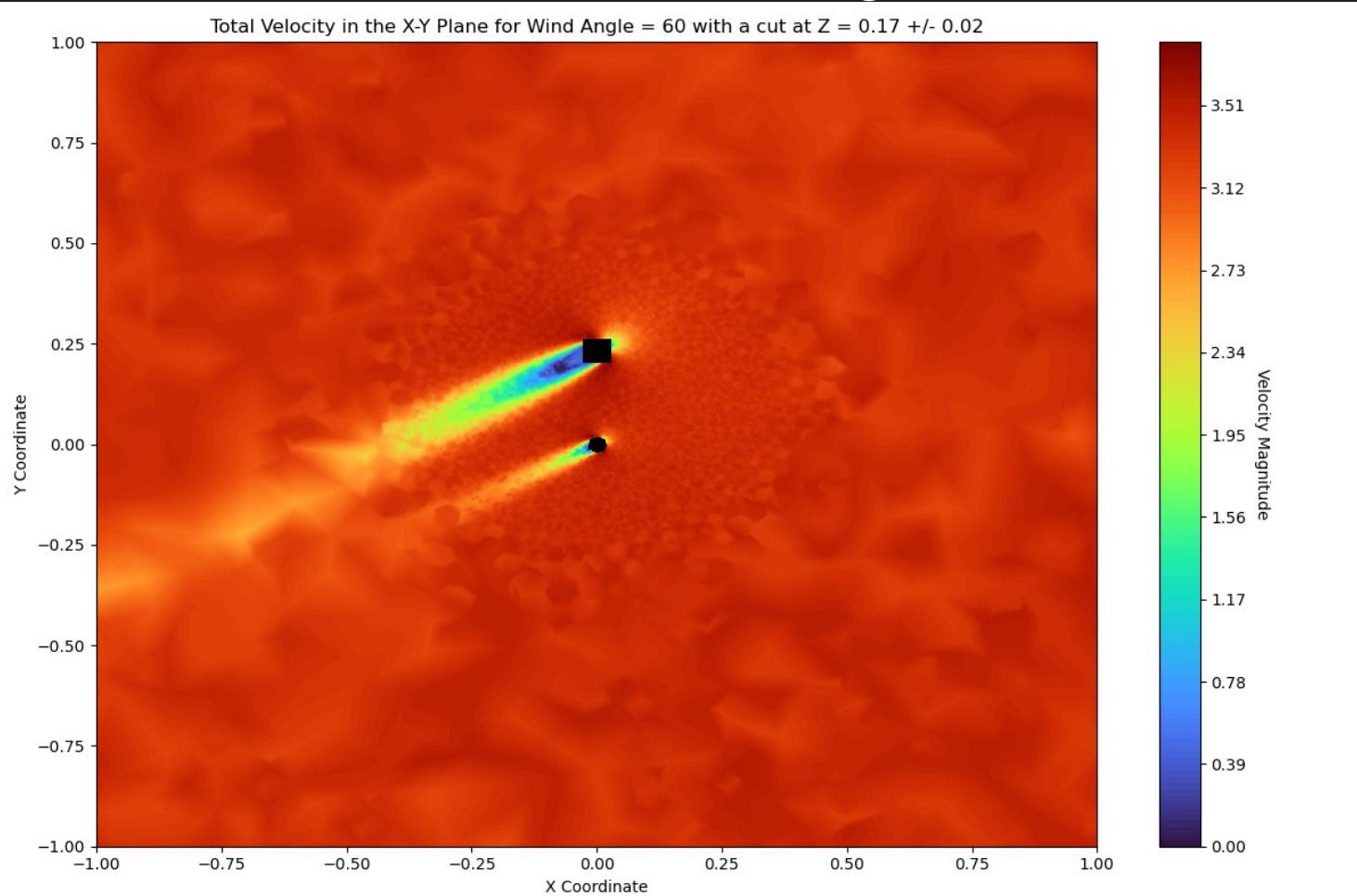
Data Plots – wind angle = 0



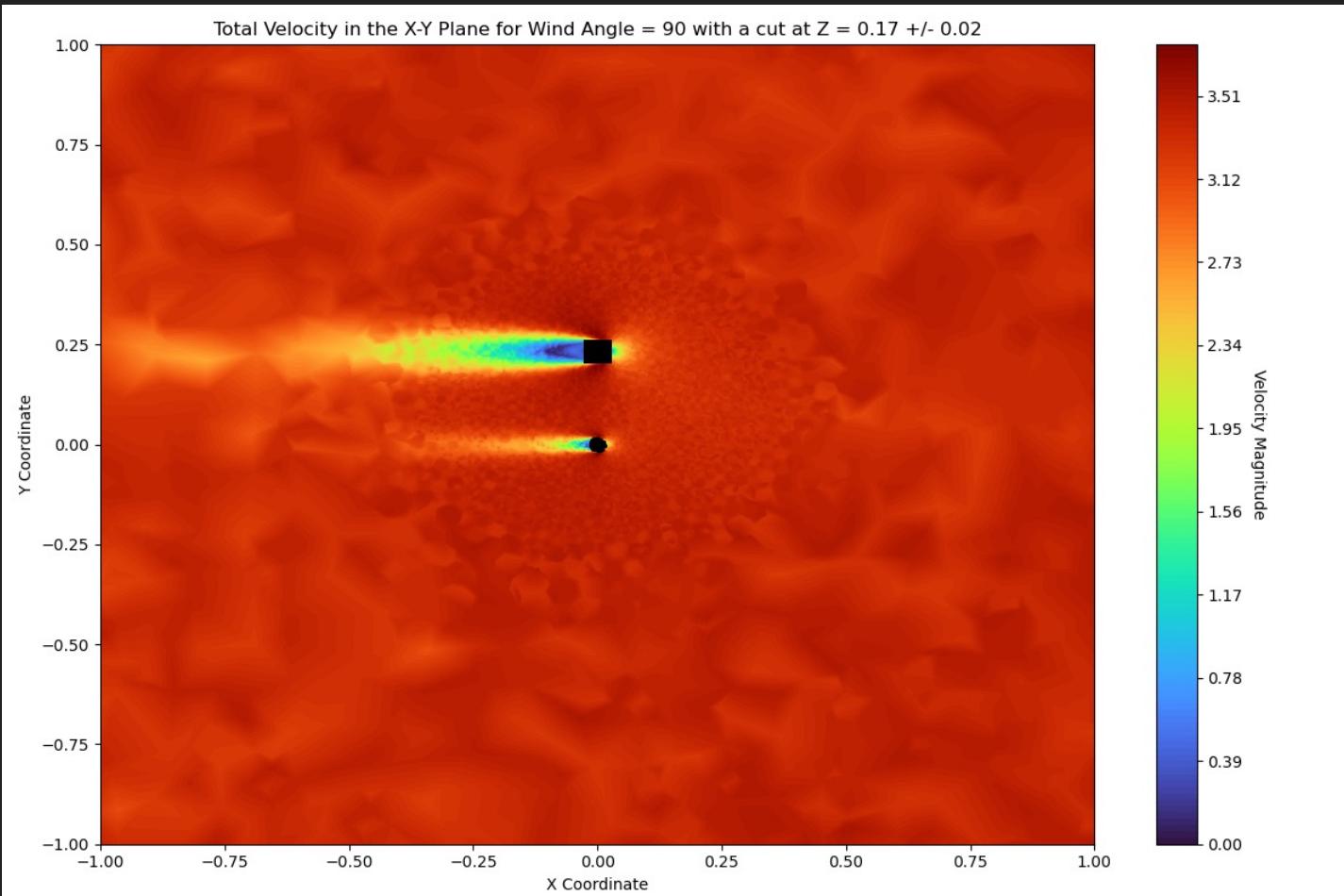
Data Plots – wind angle = 30



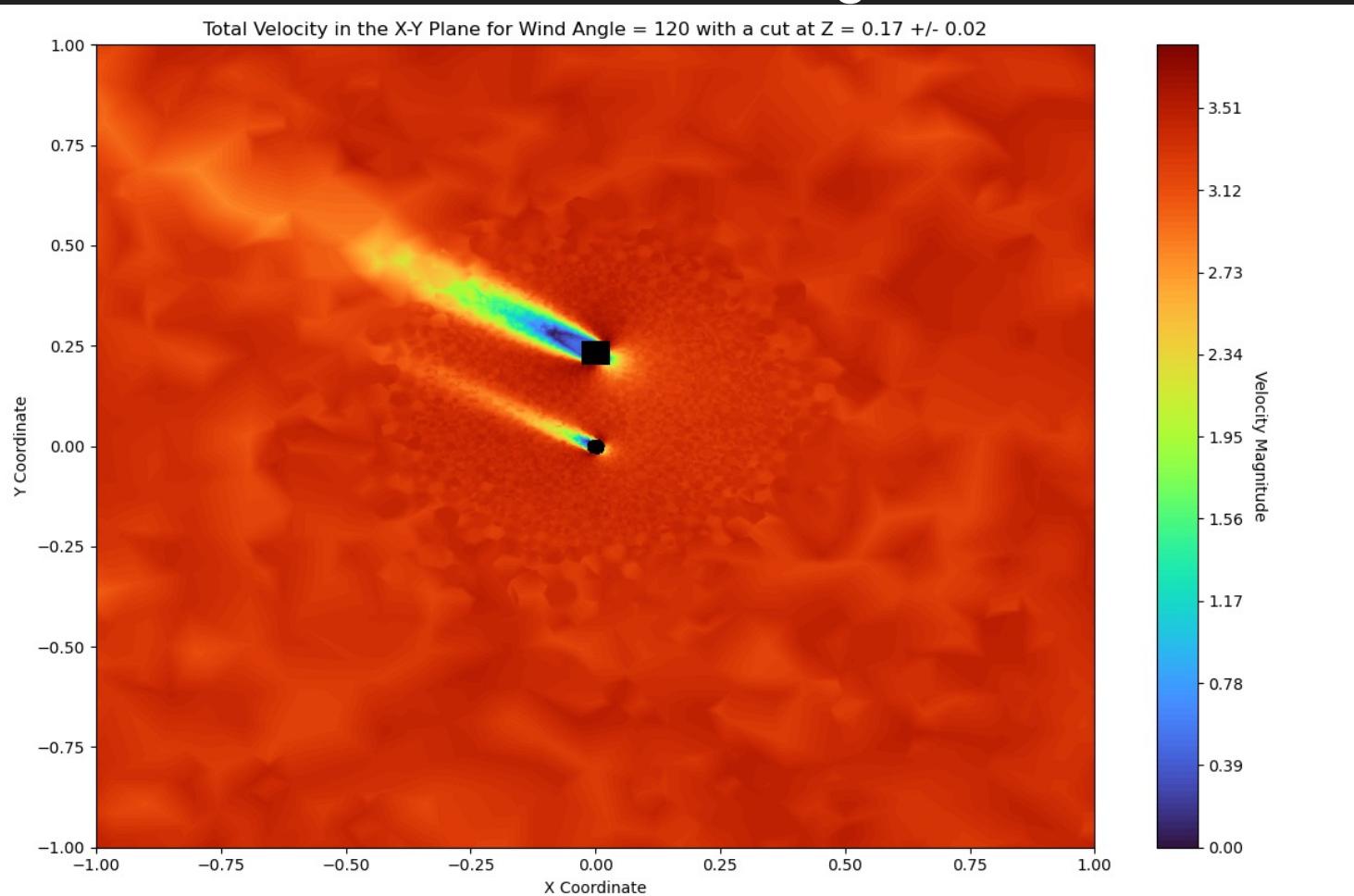
Data Plots – wind angle = 60



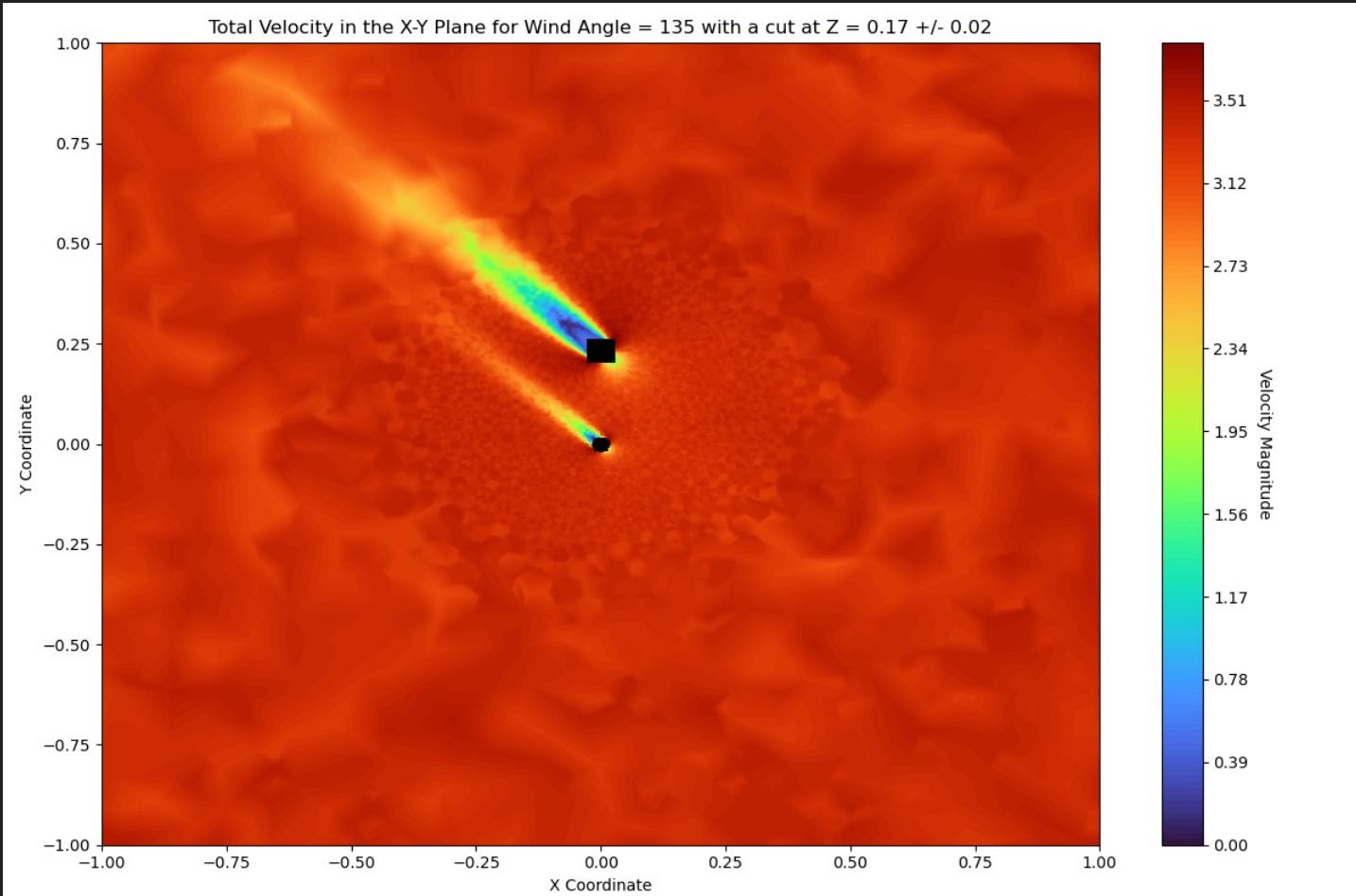
Data Plots – wind angle = 90



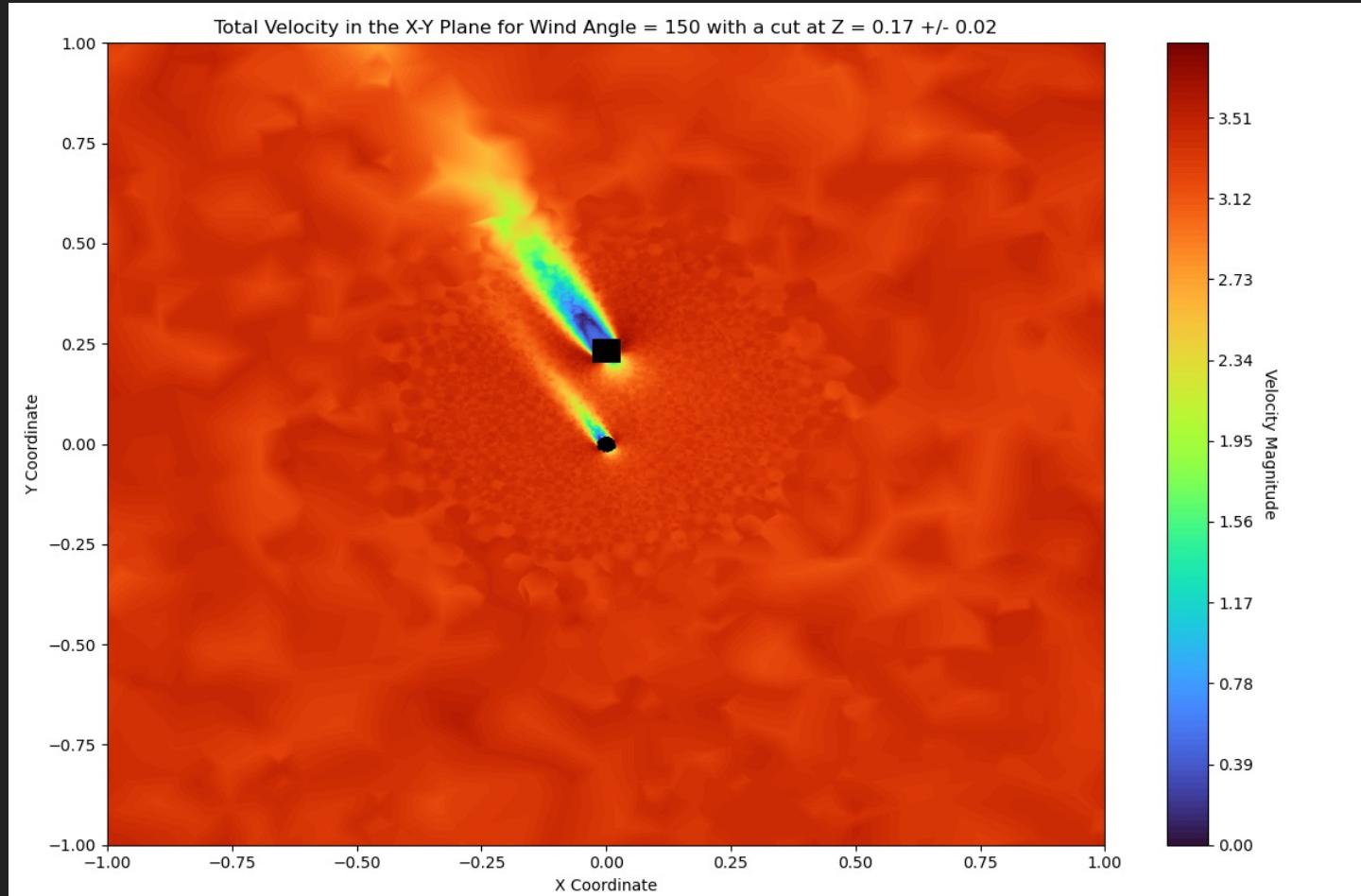
Data Plots – wind angle = 120



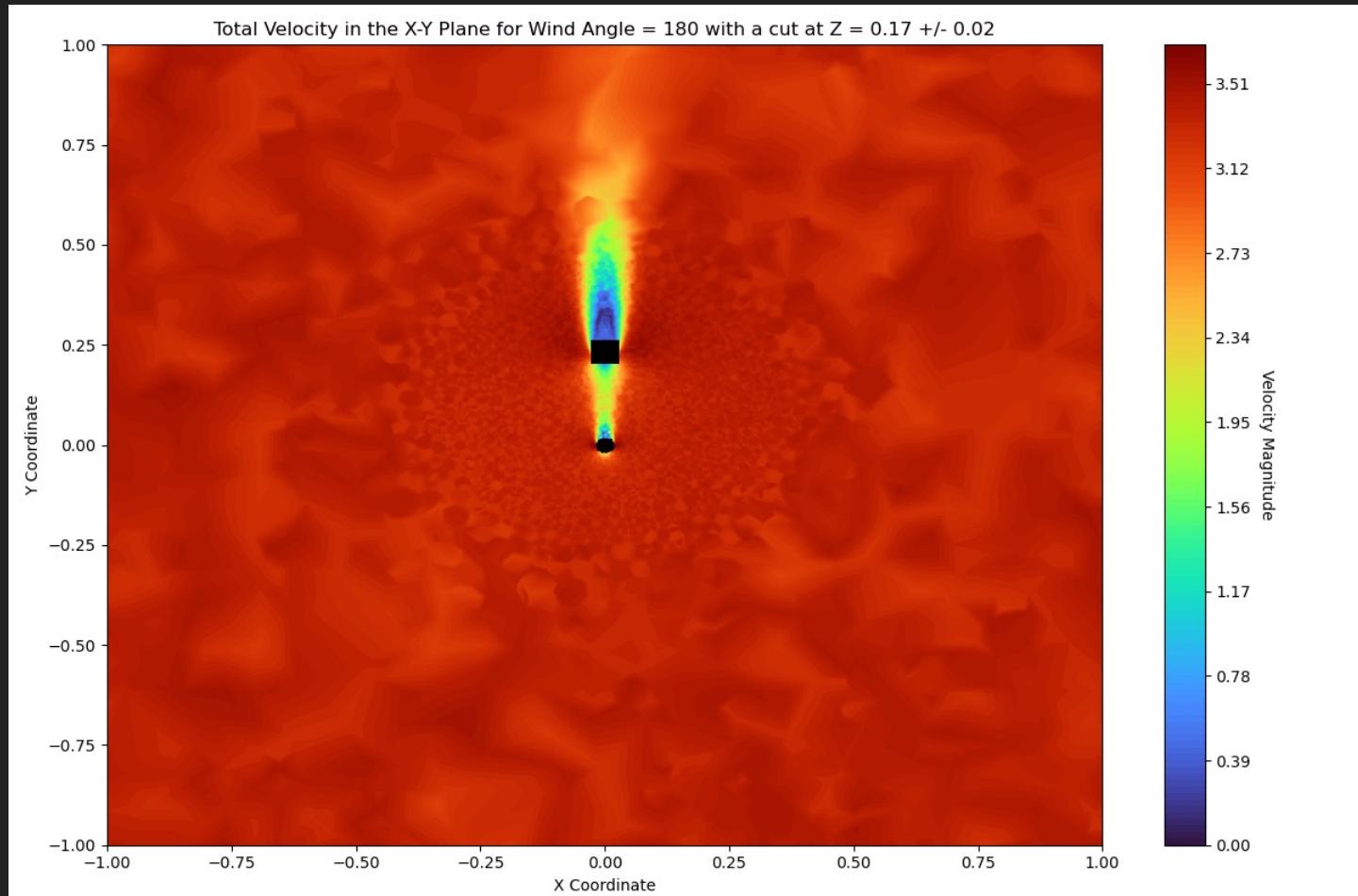
Data Plots – wind angle = 135



Data Plots – wind angle = 150



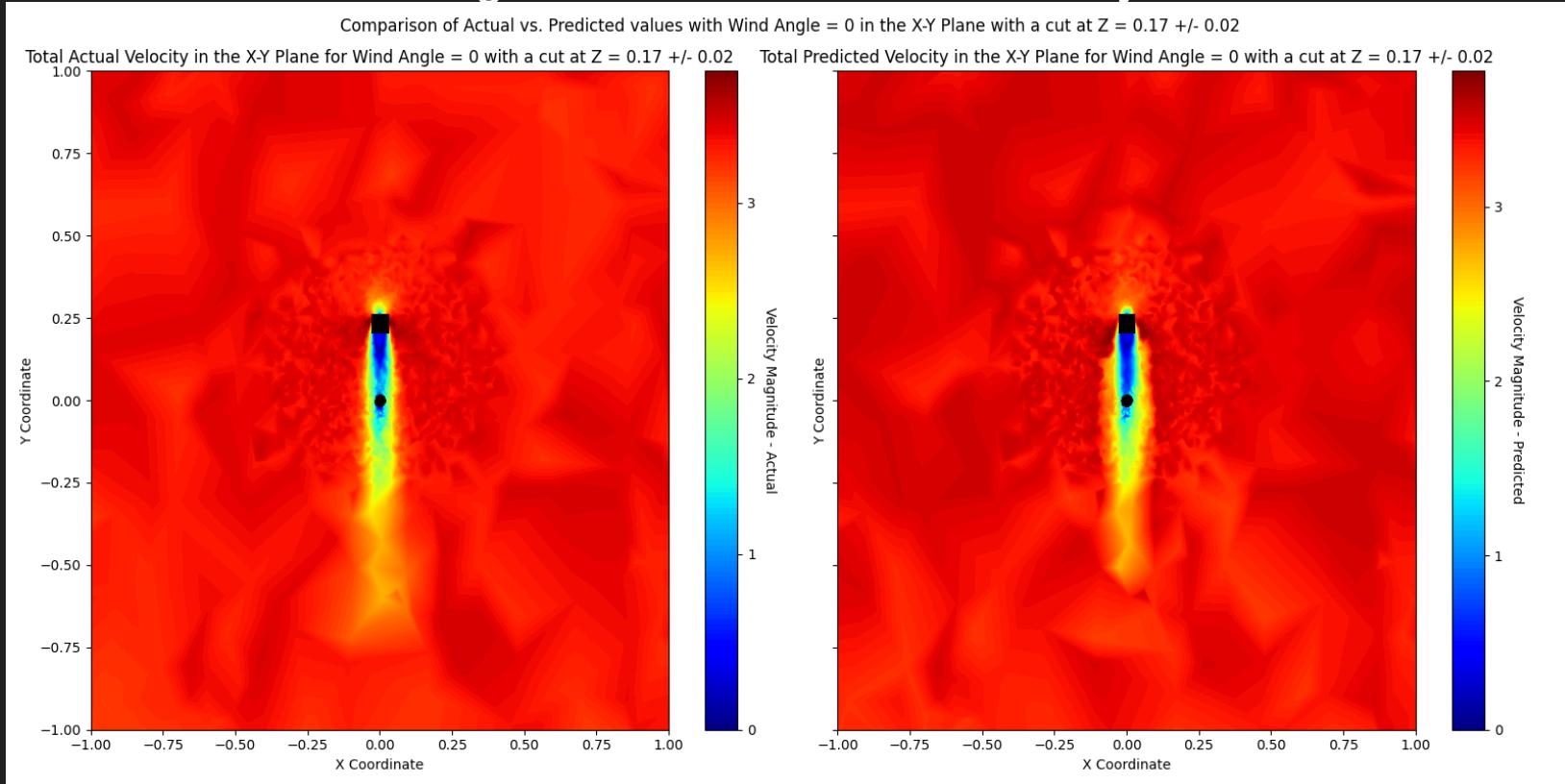
Data Plots – wind angle = 180



Progress so far - Data Loss + Cont Loss (Adam Optimizer)
Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop
Testing Results - Metrics

Variable	MSE	RMSE	MAE	R2
Pressure	0.03058529	0.1748865	0.08485891	0.99351423
Velocity:0	0.01834383	0.13543941	0.06264316	0.99091249
Velocity:1	0.03576996	0.18912948	0.09784344	0.99567361
Velocity:2	0.00020081	0.0141709	0.00805722	0.99350792

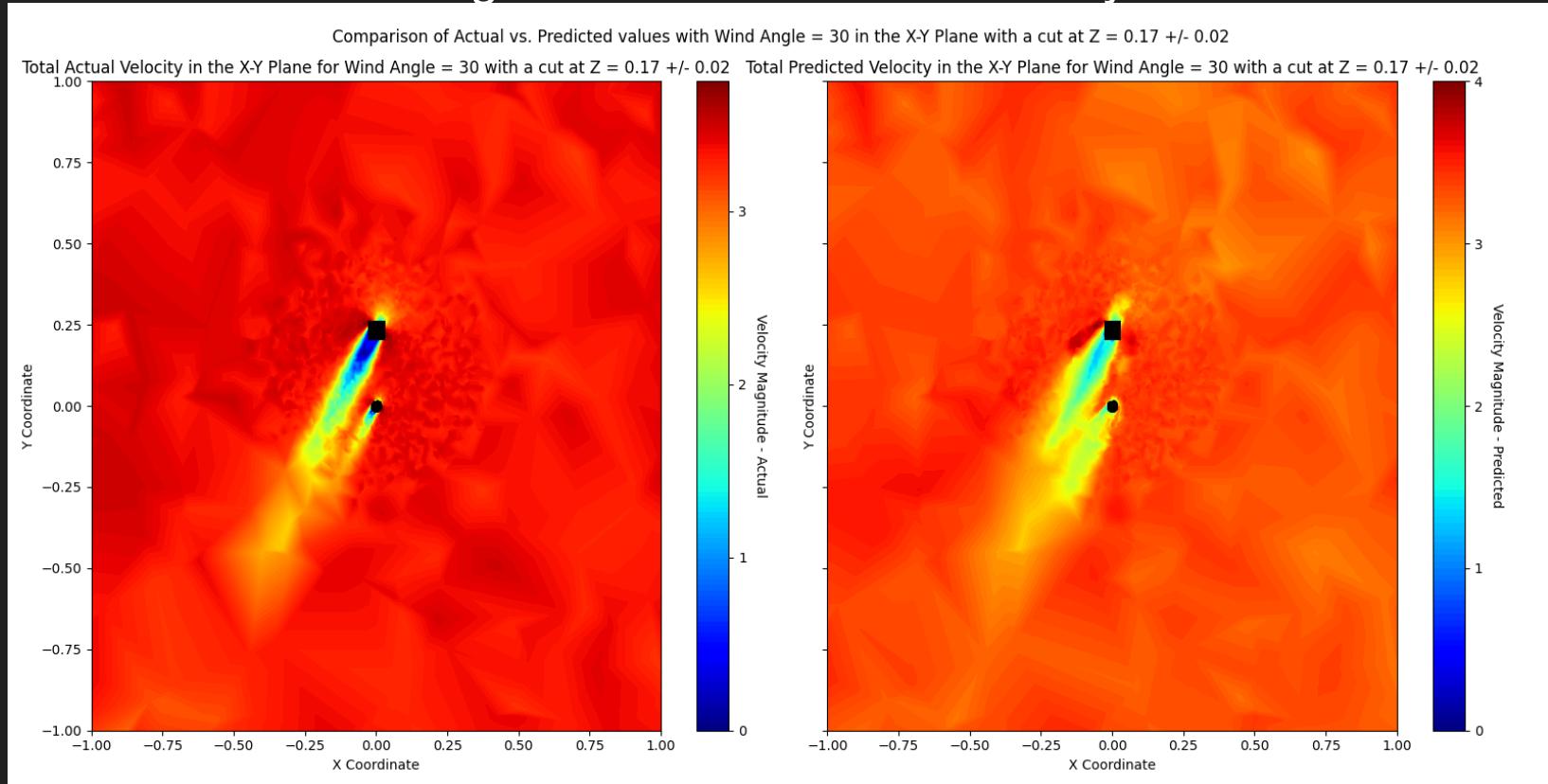
Progress so far - Data Loss + Cont Loss (Adam Optimizer)
Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop
Testing Results - X-Y Total Velocity Plot



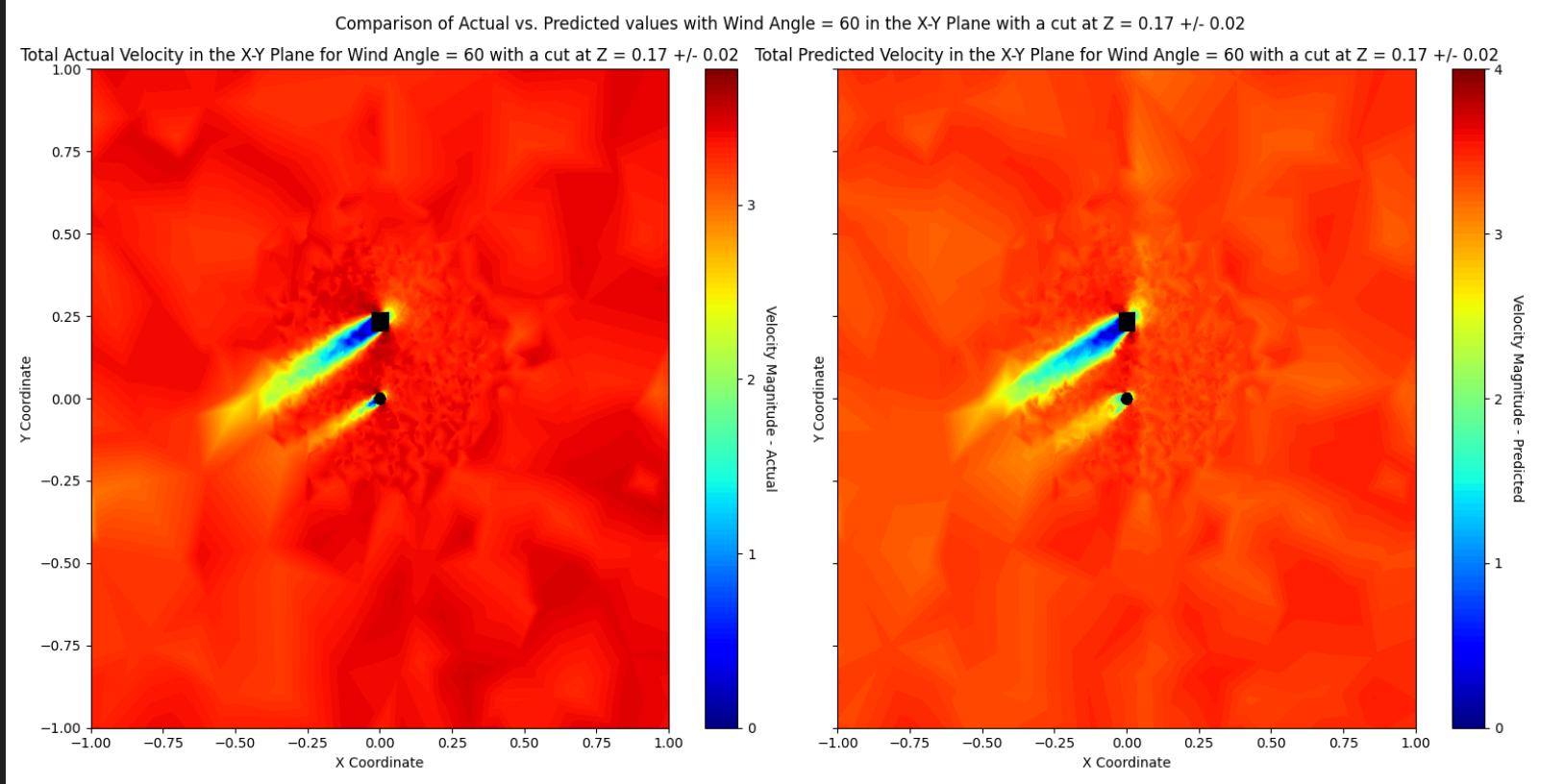
Progress so far - Data Loss + Cont Loss (Adam Optimizer)

Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop

Testing Results - X-Y Total Velocity Plot



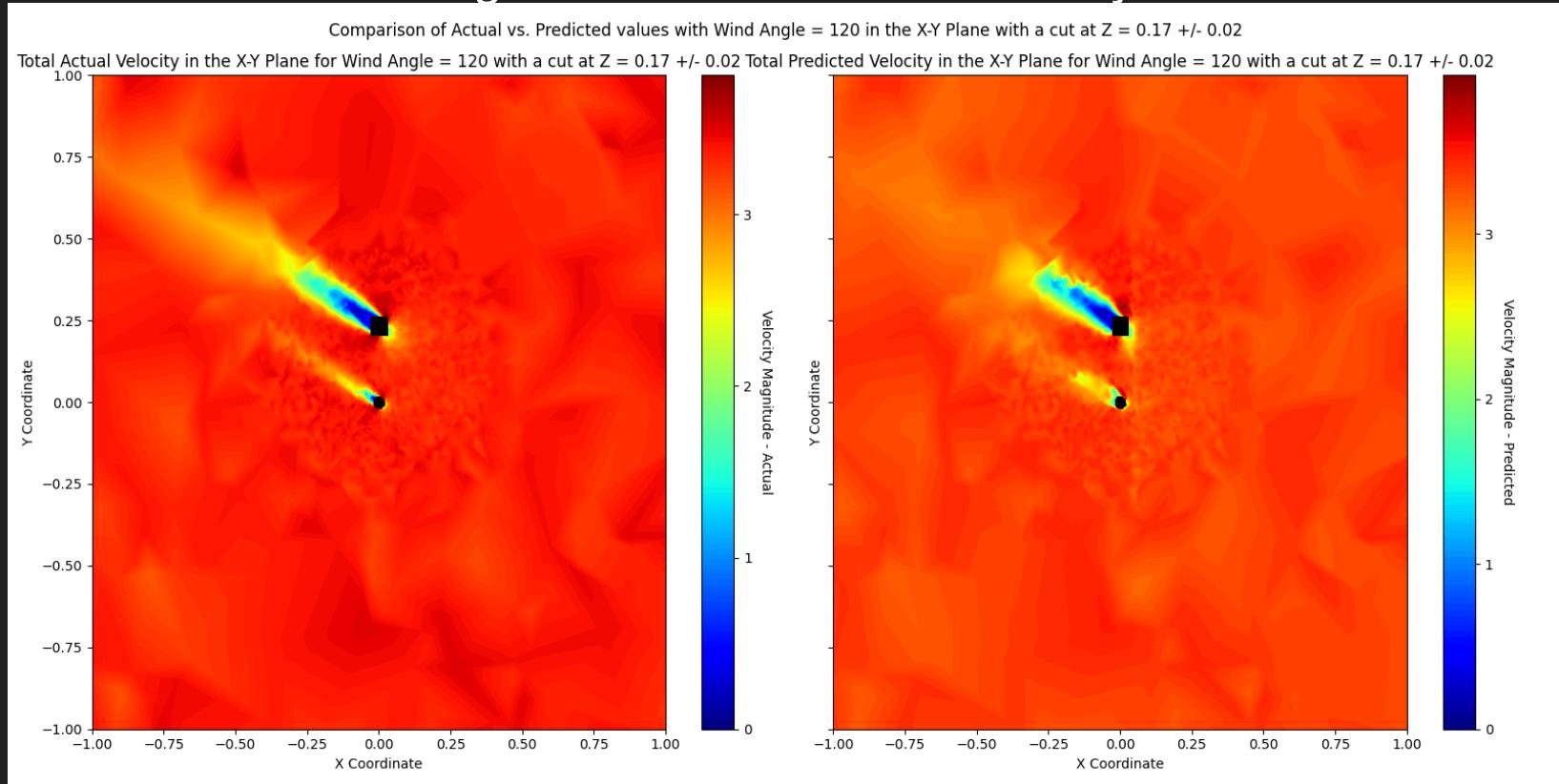
Progress so far - Data Loss + Cont Loss (Adam Optimizer) Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop Testing Results - X-Y Total Velocity Plot



Progress so far - Data Loss + Cont Loss (Adam Optimizer)

Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop

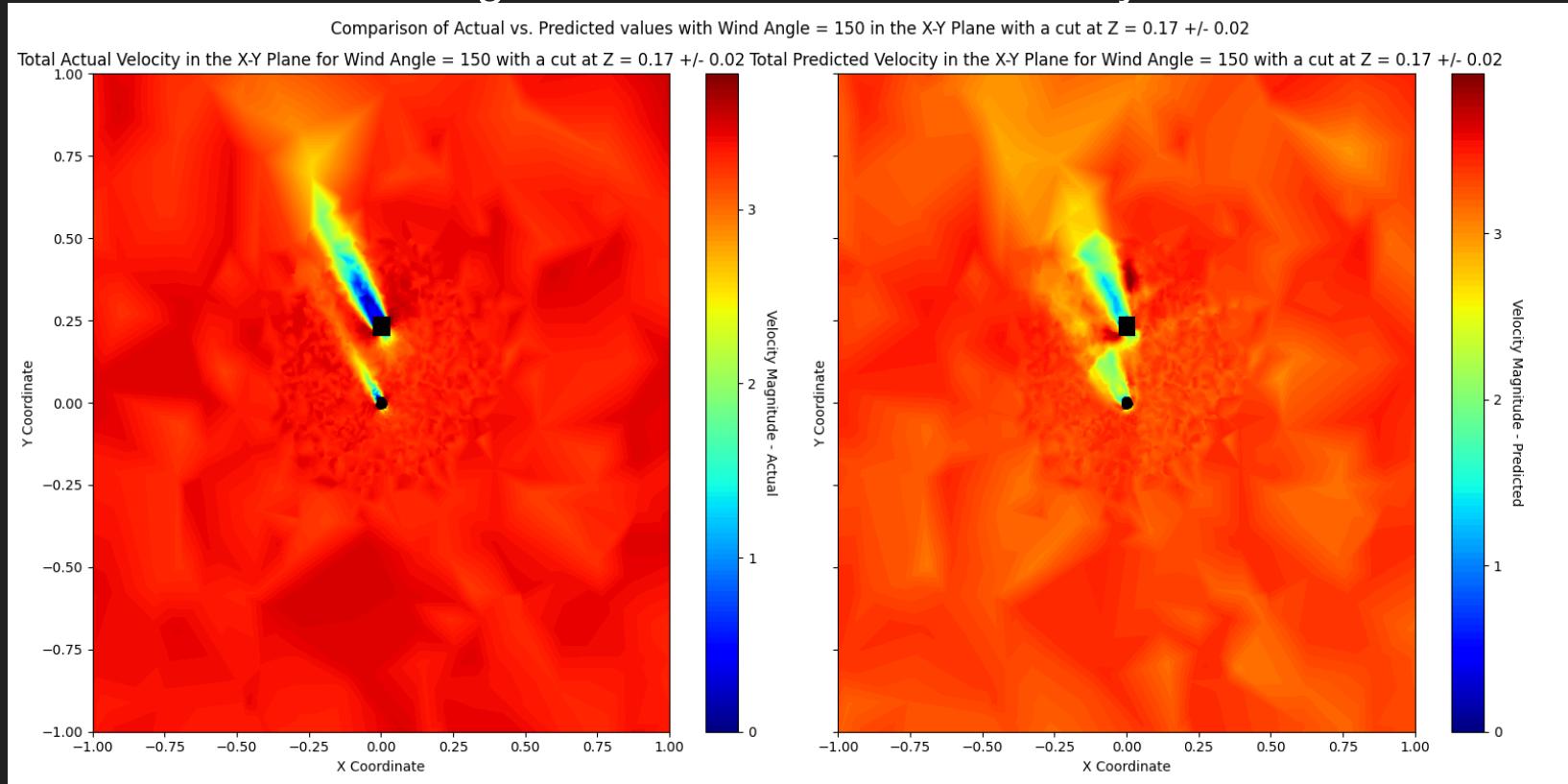
Testing Results - X-Y Total Velocity Plot



Progress so far - Data Loss + Cont Loss (Adam Optimizer)

Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop

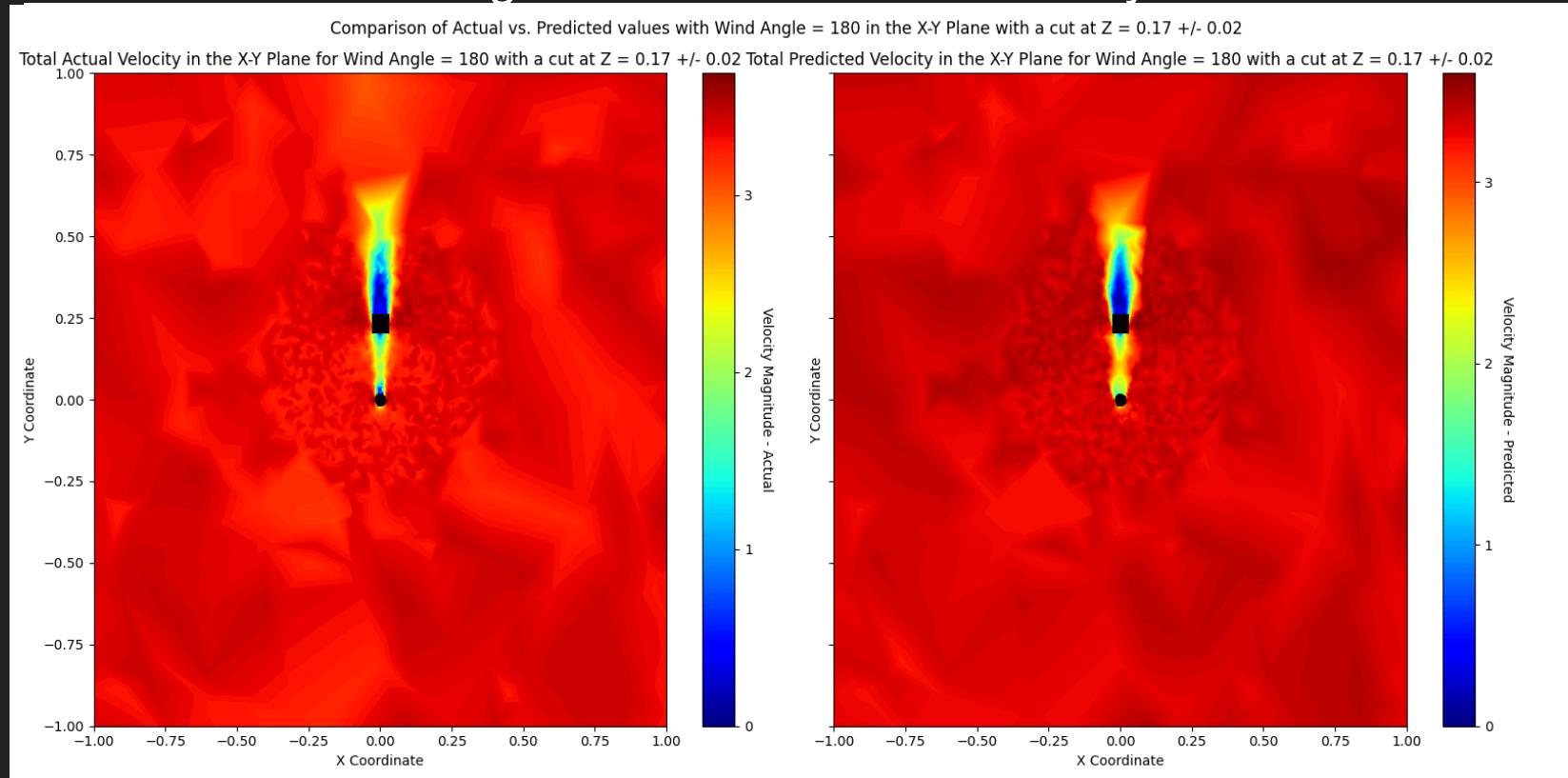
Testing Results - X-Y Total Velocity Plot



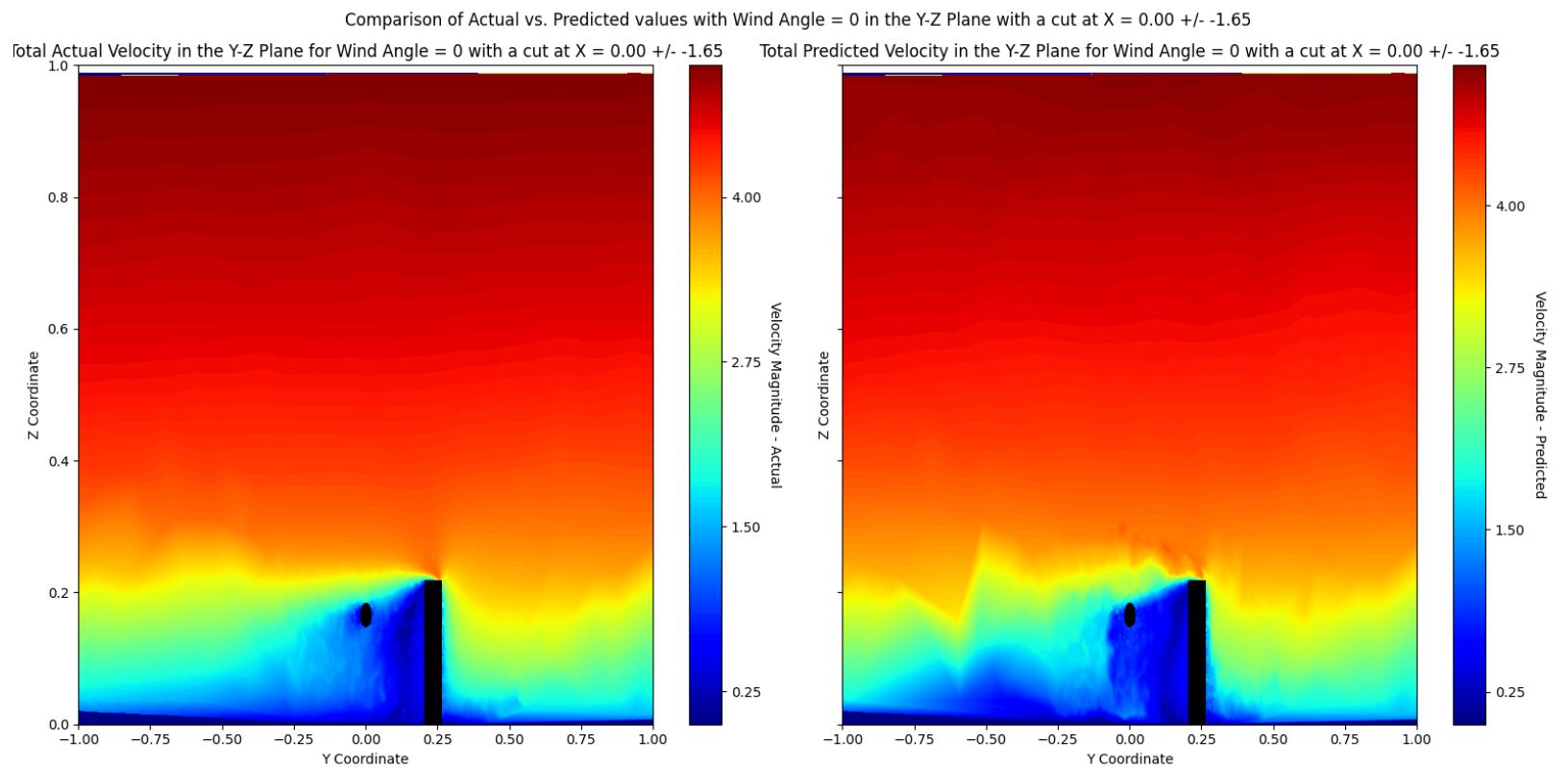
Progress so far - Data Loss + Cont Loss (Adam Optimizer)

Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop

Testing Results - X-Y Total Velocity Plot



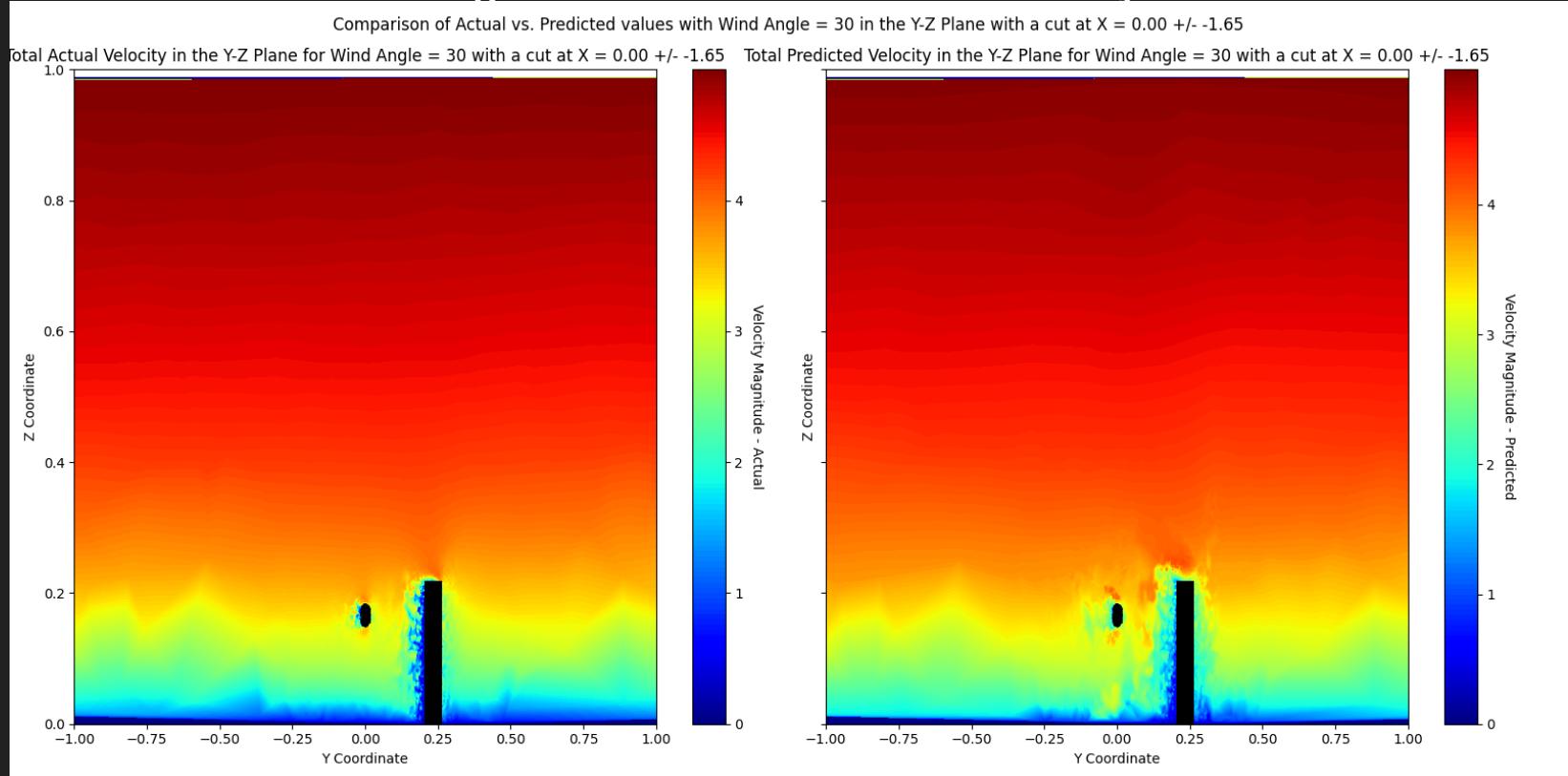
Progress so far - Data Loss + Cont Loss (Adam Optimizer)
Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop
Testing Results – Y-Z Total Velocity Plot



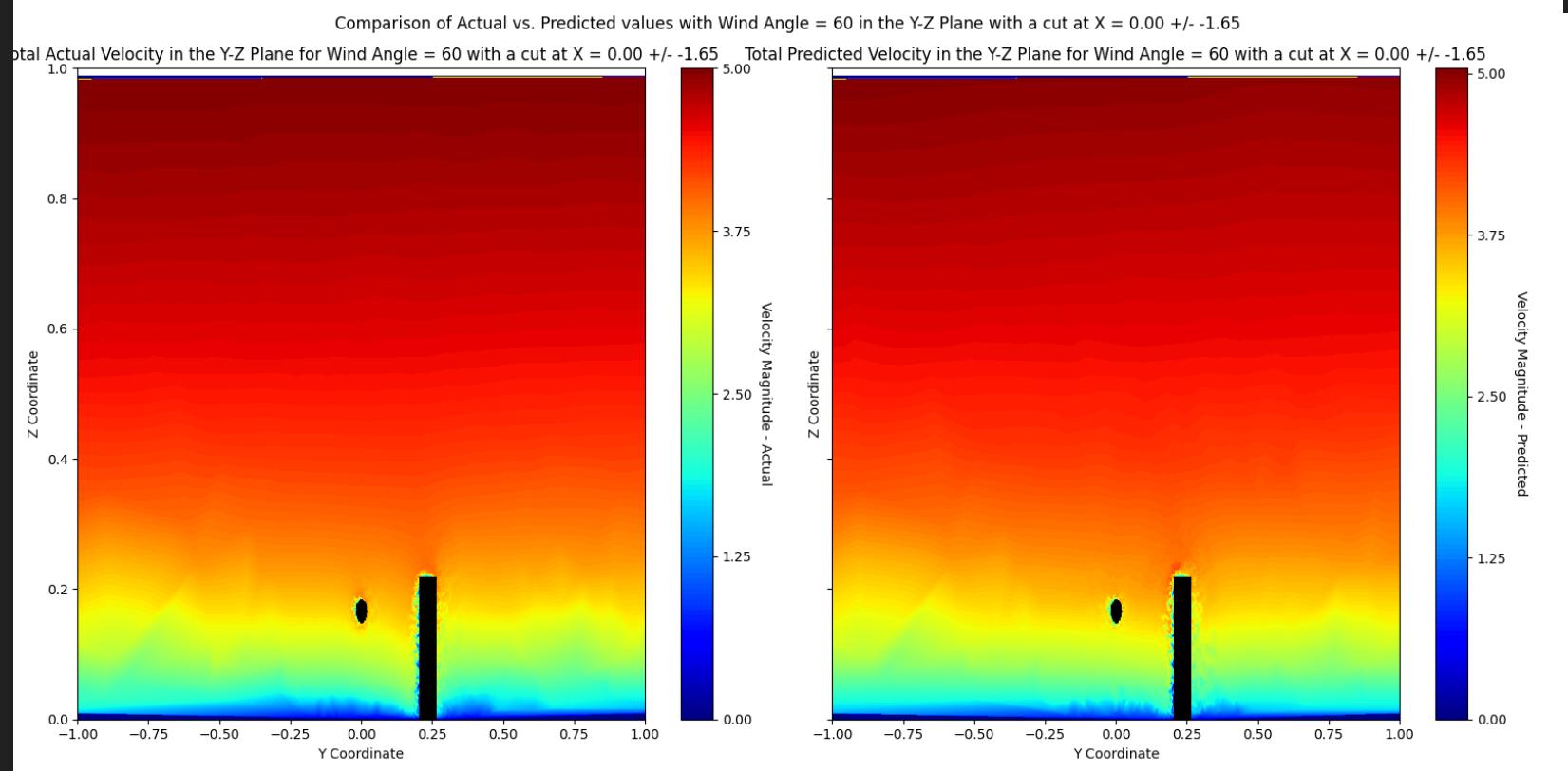
Progress so far - Data Loss + Cont Loss (Adam Optimizer)

Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop

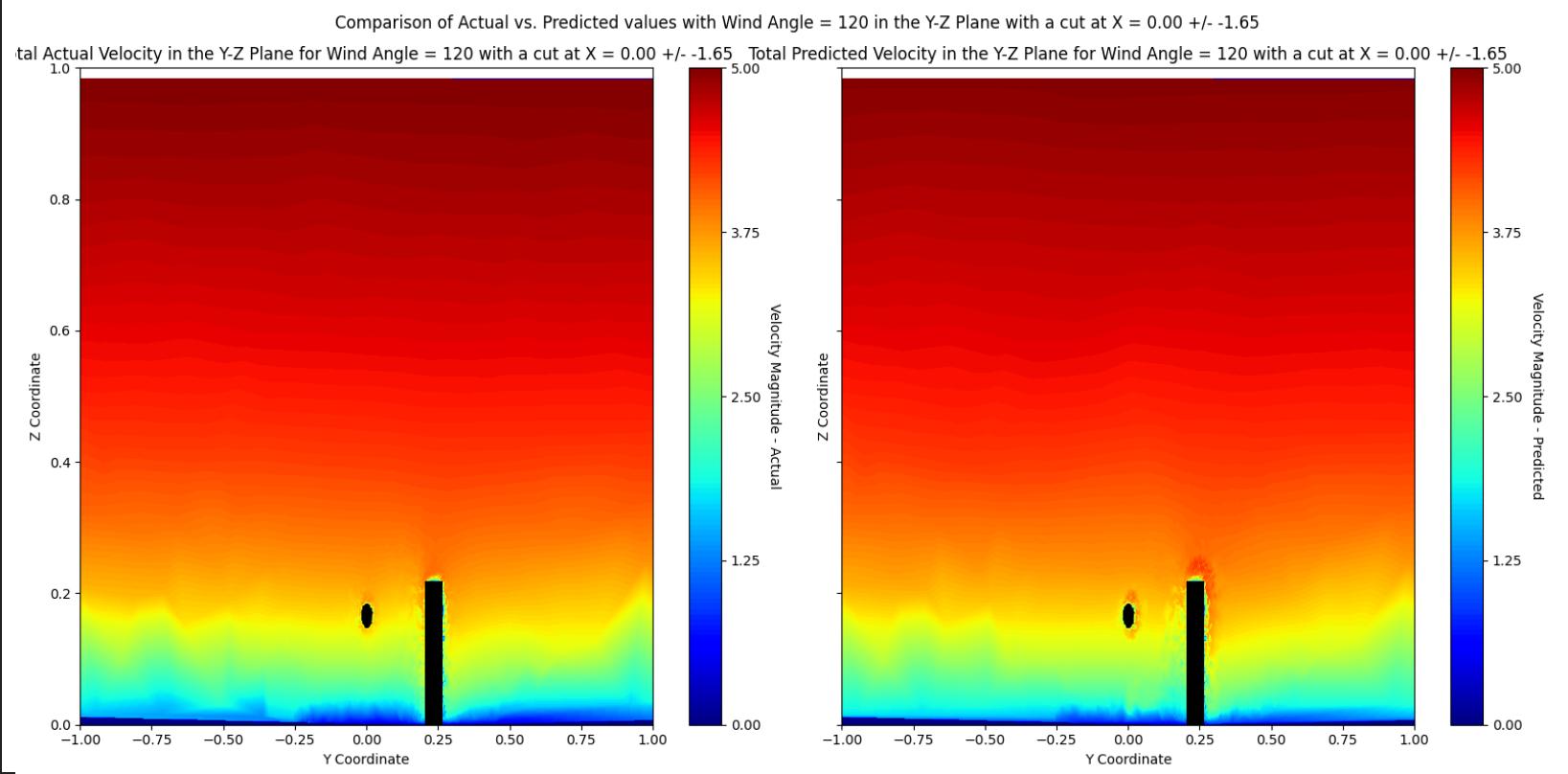
Testing Results – Y-Z Total Velocity Plot



Progress so far - Data Loss + Cont Loss (Adam Optimizer)
Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop
Testing Results – Y-Z Total Velocity Plot



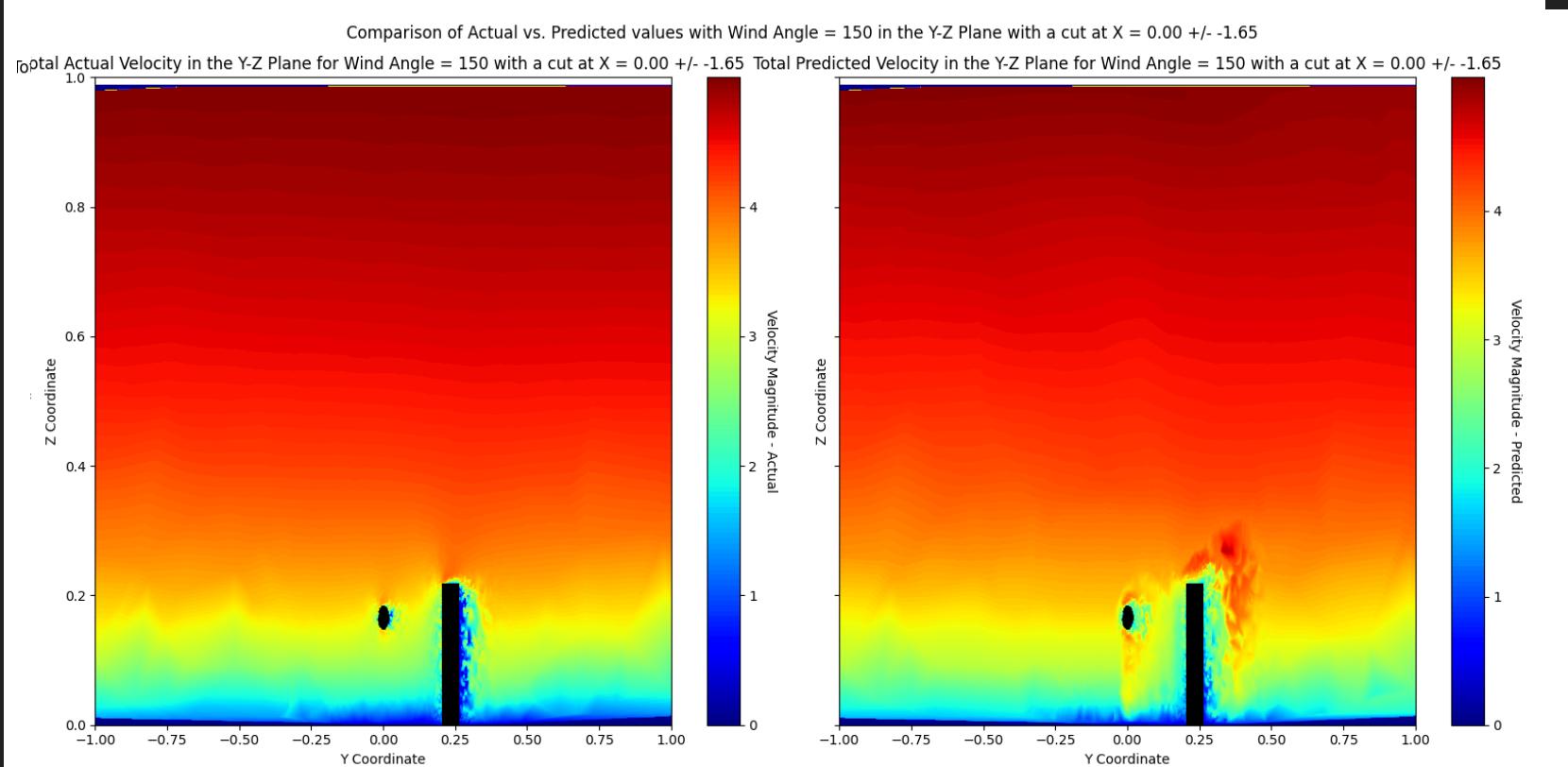
Progress so far - Data Loss + Cont Loss (Adam Optimizer)
Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop
Testing Results – Y-Z Total Velocity Plot



Progress so far - Data Loss + Cont Loss (Adam Optimizer)

Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop

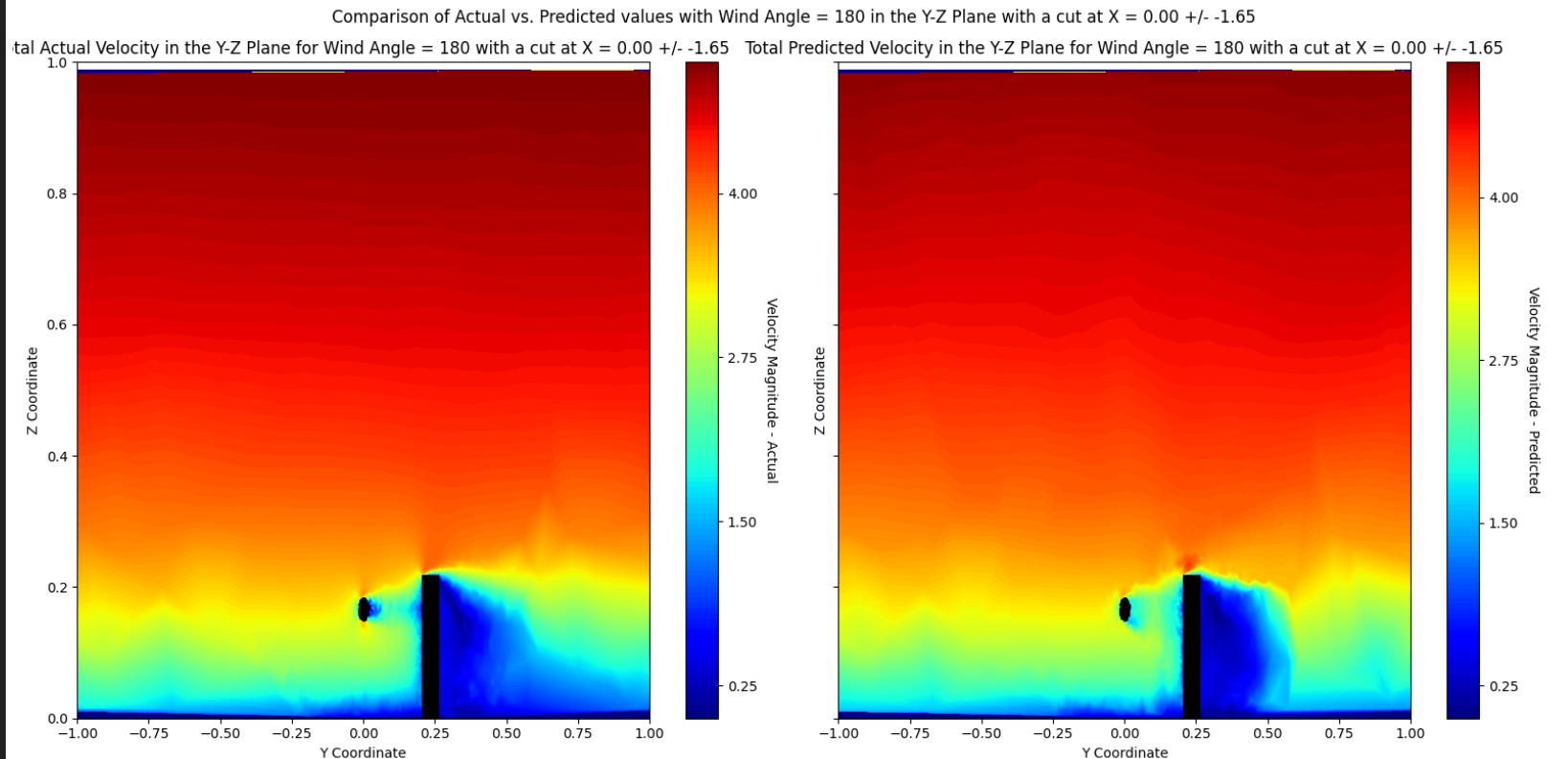
Testing Results – Y-Z Total Velocity Plot



Progress so far - Data Loss + Cont Loss (Adam Optimizer)

Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop

Testing Results – Y-Z Total Velocity Plot



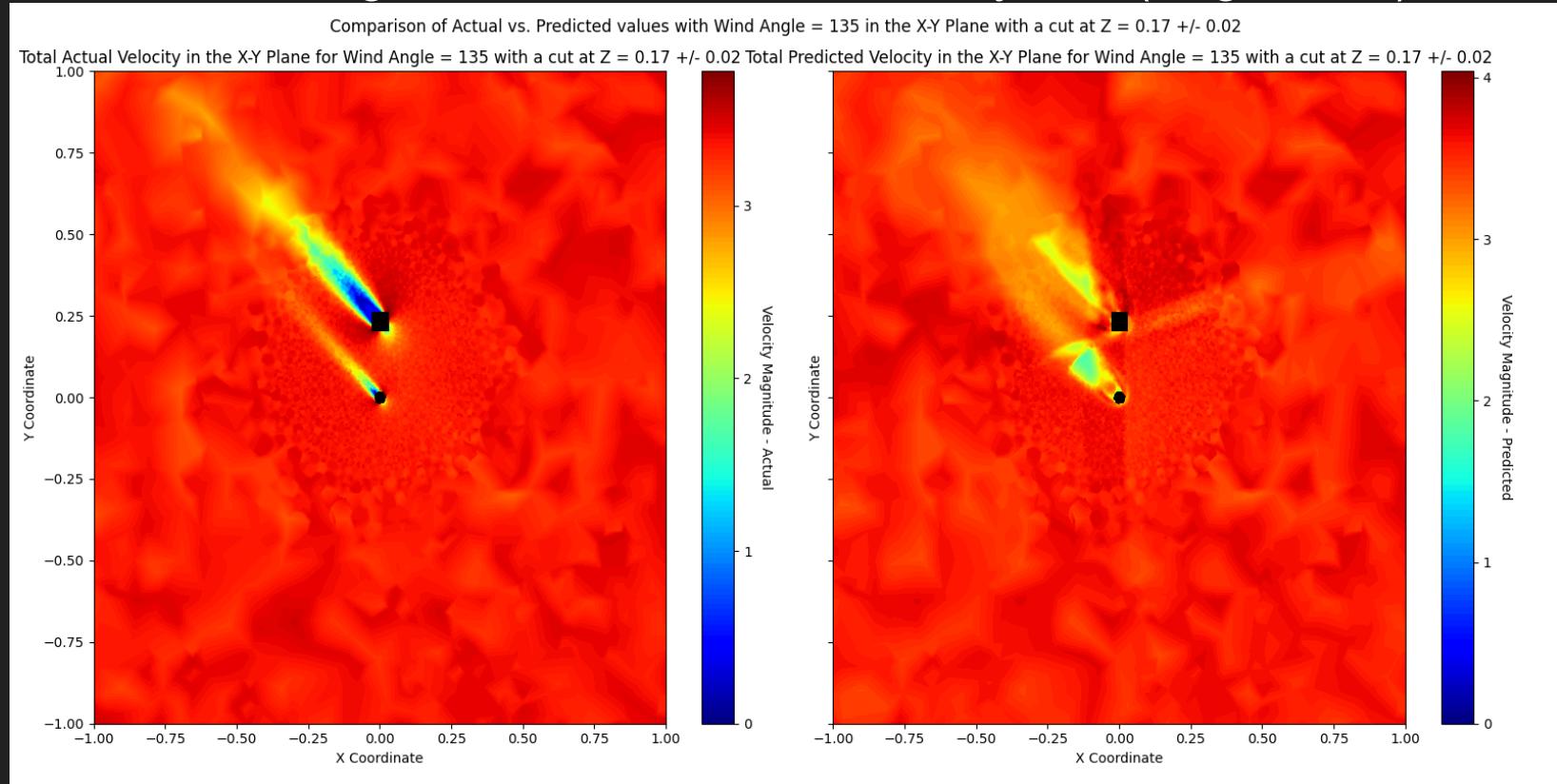
Progress so far - Data Loss + Cont Loss (Adam Optimizer)
Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop
Predicting Results – Metrics (Angle = 90)

Variable	MSE	RMSE	MAE	R2
Pressure	2.2540561	1.50135142	0.86987386	-0.2948265
Velocity:0	1.74568219	1.32124267	0.75204798	0.12026278
Velocity:1	4.33544267	2.08217258	1.99781828	-83.253256
Velocity:2	0.05317863	0.23060492	0.11664684	-0.6053989

Progress so far - Data Loss + Cont Loss (Adam Optimizer)

Threshold = 1E-5 (7680 Epochs, so far...), GPU Laptop

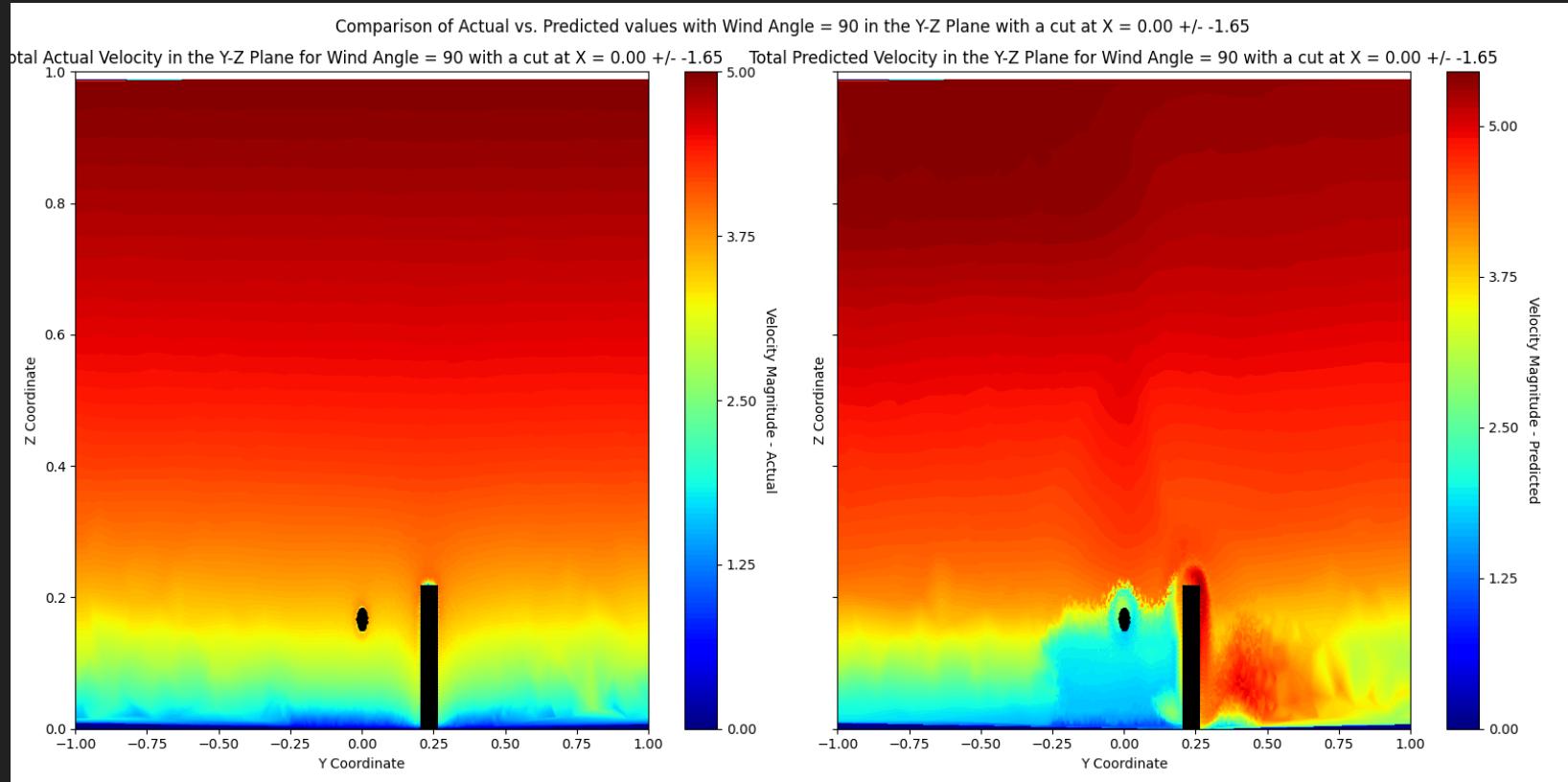
Predicting Results - X-Y Total Velocity Plot (Angle = 90)



Progress so far - Data Loss + Cont Loss (Adam Optimizer)

Threshold = 1E-5 (7680 Epochs, so far...), GPU Laptop

Predicting Results - Y-Z Total Velocity Plot (Angle = 90)



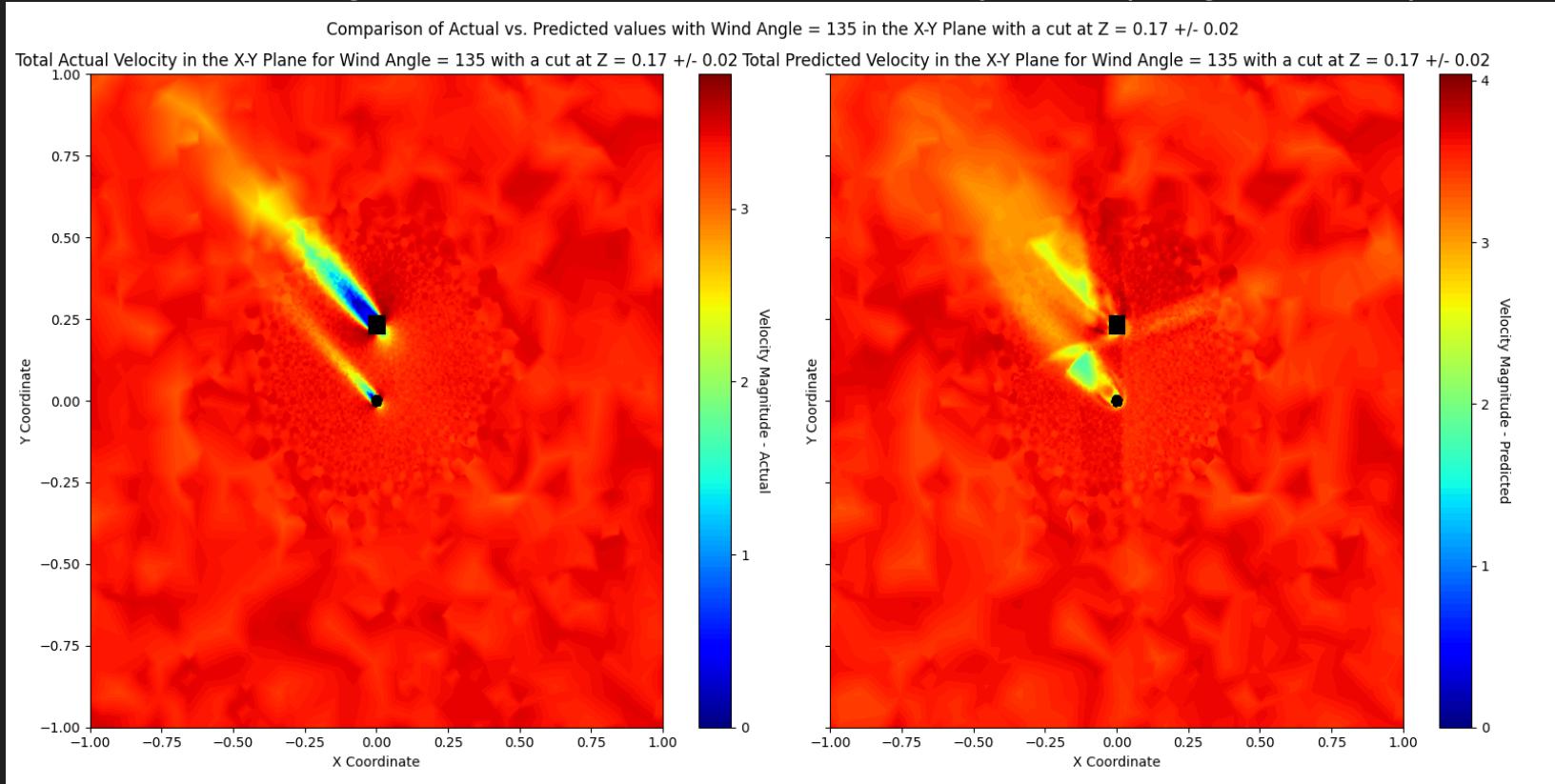
Progress so far - Data Loss + Cont Loss (Adam Optimizer)
Threshold = 1E-5 (9120 Epochs, so far...), GPU Laptop
Predicting Results – Metrics (Angle = 135)

Variable	MSE	RMSE	MAE	R2
Pressure	1.48405698	1.21821877	0.68451799	0.12204593
Velocity:0	0.29097088	0.53941716	0.24768495	0.71451734
Velocity:1	0.37020207	0.60844233	0.46084663	0.64024342
Velocity:2	0.02470386	0.15717463	0.06013675	0.2448527

Progress so far - Data Loss + Cont Loss (Adam Optimizer)

Threshold = 1E-5 (7680 Epochs, so far...), GPU Laptop

Predicting Results - X-Y Total Velocity Plot (Angle = 135)



Progress so far - Data Loss + Cont Loss (Adam Optimizer)

Threshold = 1E-5 (7680 Epochs, so far...), GPU Laptop

Predicting Results - Y-Z Total Velocity Plot (Angle = 135)

